White paper: remote digital tower for military use cases

Ensure safe air traffic control and mission success

The normal challenges of day-to-day air traffic management (ATM) are amplified in a deployed situation. The safety of participants in aviation activities is often under threat from a variety of external hazards, and rapid responses are vital to help keep traffic moving safely. To achieve these goals and help ensure mission success, air navigation service providers (ANSPs) require optimal visual information about aircraft movements and the surrounding area of an airbase, even if they are managing a small volume of traffic.

Frequentis has led the way in introducing the remote digital tower (RDT) concept to civilian and military ANSPs, which replaces the out-of-the-window view with a visualisation system located at a remote site. The RDT solution helps controllers increase their situational awareness through enhanced visibility and enables better use of resources, all without compromising on safety.

Defence

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In this paper, we will illustrate how the RDT concept is ideally suited to address the challenges facing military ANSPs by providing safe air traffic services (ATS) during military operations.

Moreover, we will demonstrate why our integrated solution offers a unique value proposition in this area; combining experience, thorough change management procedures, standards-compliant solutions, customisation options, best-in-class technology and more to ensure that your RDT project will be a success for a range of military use cases.

Delivering reliable air traffic services under extreme pressure

The stakes are always high in ATM scenarios, but situations where military personnel are deployed up the ante even further. Whether military forces are participating in combat operations or providing humanitarian relief after natural disasters, the success of their missions can hinge on access to reliable, responsive ATS.

Beyond the usual challenges of ATM, military ANSPs face some additional complications. Controllers' safety may be at risk due to a range of external threats: from the danger of war situations to the chaos of major catastrophes. In addition, military air traffic control (ATC) towers often need to be placed in remote locations. Both of these factors mean that it can be challenging and costly to protect airbases and deploy an adequate mobile infrastructure.

Traditional ATC towers deployed in military scenarios are more at risk for limited visibility, as weather conditions can be difficult. Since timely access to information and rapid responses are crucial to missions, losing a tower can have major consequences. Similarly, large amounts of aircraft may need to arrive or leave an area within the same short window of time in deployed situations, which can put considerable strain on limited ATC resources.

Military ATC can fulfil their mission from a safe, protected and remote location and are separated from sensor equipment. To protect electro optical or radar sensors from attacks, protection concepts or technologies can be included.

Finally, ATC towers can be a tempting target where controllers are endangered and the loss of ATS might occur. The emergence of drone technology means that military ANSPs must be ready to deal with a new challenge and growing threat. Early detection of drones using electro optical and surveillance sensors to ensure an identification friend or foe (IFF) classification is essential to protect high value assets on an air base.

Recognising the game-changing impact of RDTs

RDTs can help military ANSPs mitigate these challenges and enjoy a range of benefits. But what is an RDT? The Single European Sky ATM Research (SESAR) defines the

remote digital tower concept as a situation where ATS are remotely provided through direct visual capture and visual reproduction (for example, with cameras). The ATS are provided using a remote tower centre (RTC), which includes operator workstations, ATM systems and display solutions.

The ability to remotely control air traffic is what makes the RDT concept so well-suited to military use cases. It allows military ANSPs to deploy towers that provide enhanced efficiency, vision and cost-effectiveness compared to mobile towers, so they can overcome challenges such as limited visibility. Mission-proven sensors guarantee the operational readiness of a remote air base or deployed ATC operation even in harsh weather conditions. RDT can also be implemented in remote and hazardous locations extremely quickly.

Taking the RDT concept a step further

Beyond the benefits of protecting controllers from harm and ensuring ATS, the RDT concept also gives military ANSPs the opportunity to gain enhanced shared situational awareness – provided they are equipped with the right tools.

This is where Frequentis comes in. Working together to deploy an RDT approach means that you can take advantage of a fully integrated, best-in-class product portfolio, which encompasses solutions for visualisation and surveillance, information and control, red/black communication and flight data handling. Extensions include drone detection, surveillance sensors, asset tracking, airbase protection and surveillance fusion. To underpin the entire RDT infrastructure, we can provide ATM-grade networking and recording capabilities. Customisable and integrated working positions for controllers provide scalable panoramic views. The RDT displays information from a wide range of sensors, and can be controlled via intuitive multitouch gestures and configurable 'shortcuts'. Crucially, Frequentis architects its solutions based on industry best practices and security standards.

With a proven track record of successful deployments, Frequentis has developed extensive experience and a highly effective approach to change management and user adoption. If you would like to start small, you can rely on support for an RDT pilot with test installations, iterative evaluations and help to build a scalable business model.

Beyond that, you can take advantage of a compact solution profile with flexible camera configurations, commercial-off-the-shelf (COTS) components and surveillance-based tracking. For high-performance solution requirements, high-performance infrared cameras, object bounding and modular pan-tilt-zoom (PTZ) cameras are available.

Frequentis recognises that every use case is unique in some way, therefore customisation to fit specific needs around scalability and integration is the central part of our offering. Likewise, no solution is ever fixed in stone: you need platforms that are built with one eye on the future, open to enhancement and evolution as future scenarios mandate.

Putting remote digital towers into action in the field

Domestic airbase operations

For domestic airbase operations, RDT can optimise the use of personnel, which can be especially beneficial for small satellite aerodromes that manage few or very infrequent movements. By embracing the RDT concept, these aerodromes can achieve more efficient staffing and overcome resource scarcity. They can also improve the morale of their personnel by avoiding sending them to work at remote locations.

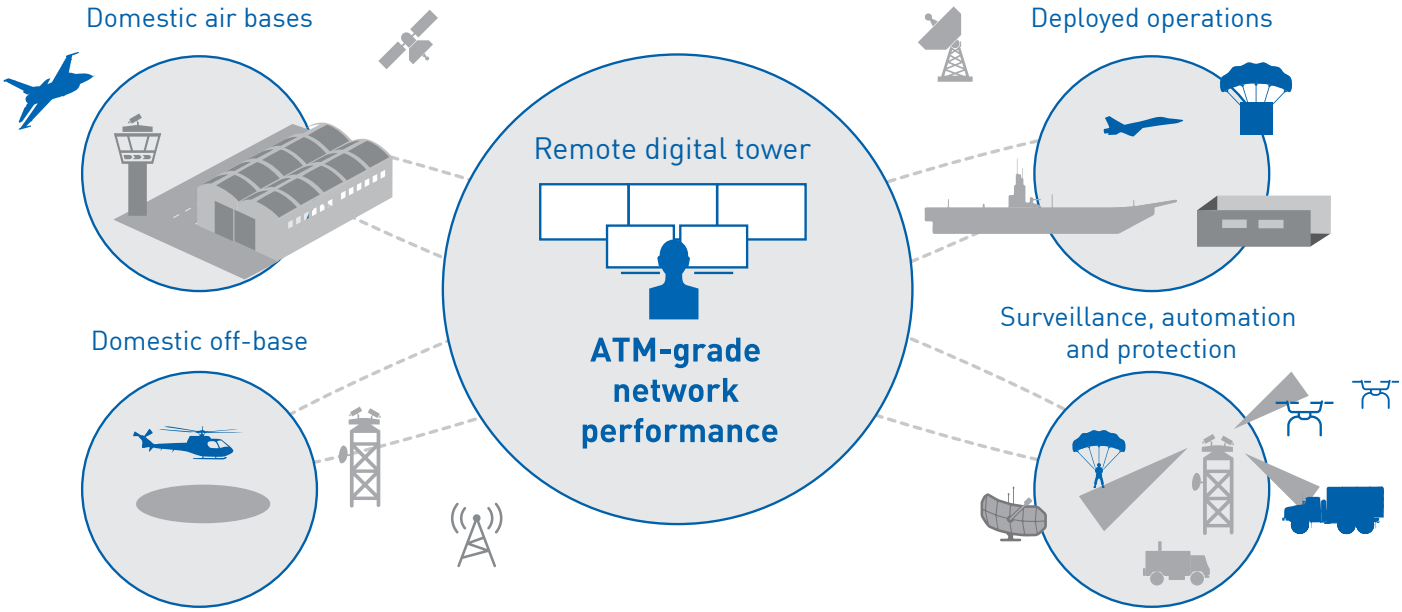
RDT also offers a cost-effective alternative to constructing new towers or renovating out-of-date infrastructure, enabling military ANSPs to avoid large capital investments. They can act as a contingency tower if something goes wrong, reducing risk of losing ATS. In addition, RDT can provide enhanced visibility and safety capabilities to domestic airbase operations, augmenting existing technology with best-in-class visuals and object detection.

This use case for RDT also offers military ANSPs the opportunity to take advantage of sensor systems deployed as part of the solution in other ways. For example, they can share the information they gain with parties such as fire services, base security and air defence units.

Domestic off-base operations

With RDT, military units can introduce ATC services to areas where no ATS was available in the past. For example, they can be used for remote landing sites, emergency landing strips, sleeping or bare bases (temporary bases for fighter squadron operations) and weapon ranges (where bombing operations are surveyed). These capabilities reduce the need for personnel to work in remote locations and help augment controllers' visibility, object detection and decision-making ability.

Figure 1: Remote digital towers for various military use cases



Deployed operations

In combat operations, one of the biggest advantages of RDT is the additional safety and security offered to controllers by avoiding the need for them to enter dangerous environments. Armed forces need to be ready to fulfil their mission in limited time, therefore, ATC operators clearly benefit from procedures and equipment which is familiar to them. Applying the same technology as in their home nations, ATM operators have the experience and training they need to fulfil their mission in an unknown environment. RDT also provides enhanced shared situational awareness and object and threat detection on ground and air, both of which can be crucial to mission success.

When military units are deployed to provide humanitarian assistance – such as after a natural disaster – huge numbers of rescue personnel pour into the area and the air traffic situation can be hectic. With RDT, controllers can take advantage of enhanced vision to coordinate traffic safely, without putting themselves in harm's way. If existing ATC towers have been compromised, an RDT can provide a contingency option at short notice.

Furthermore, leveraging RDT for deployed operations can help ANSPs share data about missions with their home country. As a result, reuse of RDT for multiple use cases may enable significant cost savings.

Surveillance, automation and protection

By integrating drone detection into RDT, ANSPs gain a safer alternative to traditional approaches to military ATM, helping to bolster airbase and flight security. Personnel involved in protecting airbases can reuse information from the sensor suites of the RDT to enhance their ability to identify and react to threats. Similarly, airbase operation centres can utilise the data to coordinate activities with other parties, prepare for weather events, track assets and combine data with other systems to further enrich their situational awareness.

Conclusion

The RDT concept has already gained traction in the civil sphere, and has the potential to add even greater value in military scenarios. By enabling users to provide ATC services on demand and remotely, RDTs can reduce risk to personnel, help avoid capital investments and optimise the allocation of resources. Equipped with improved shared situational awareness – as well as object detection and tracking – military personnel can approach missions with greater confidence.

These benefits are not restricted to operations in deployed situations and natural disasters: they can also play a pivotal role in peacetime operations in your home country. As we have shown, RDT is about much more than replacing the out-of-the-window view. The companies can help you solve the military ATC challenges you face today, with an eye on the new requirements on the horizon.

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