White paper: deployable digital towers for military air traffic control

Maximising flight safety in even the most remote and hostile environments.

With defence forces under unprecedented pressure to respond to emerging threats, the challenge of ensuring safe, orderly and expeditious military air traffic control (ATC) is greater than ever. However, most forward-operating deployable tower solutions available today are not as well equipped as conventional towers. There is less space for operators within the cabins, the operating height is limited, and in a contested environment, mobile towers are an easy target.

Digitalisation is a game changer that enables the introduction of deployable digital towers without compromising safety, security, quality or comfort. Deployable digital towers increase the flexibility of military aircraft while enhancing situational awareness for controllers.

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Adapting to a changing landscape

In recent years, there have been enormous changes in the demands placed on defence forces. From dealing with rapidly evolving threats to supporting security and disaster-relief operations worldwide, these organisations are under tremendous pressure to respond more quickly and effectively.

In military ATC, the greatest challenge is ensuring the safety of forces in the air and on the ground. Increasingly, forces are deploying autonomous military ATC capabilities alongside manned units, often in remote or hostile environments. To succeed, they need a compact, easy-to-implement and -manage deployable tower solution, which can be operated from a safe environment.

Air operations today tend to rely less on large overseas bases as hubs for projecting combat power and more on forward operating bases for launching, recovering, and maintaining aircraft, in concert with allies and partners. Deployable towers and tower automation are vital to support this paradigm shift. The key objectives are to maximise the reliability of operations and communications, achieved through a decentralised approach that enables flexibility and resilience.

Transparency and shared situational awareness are also becoming more important than ever to the success of missions. Military ATC organisations therefore require solutions that can create, improve and share situational awareness, and establish a full audit trail.

Finally, operator training continues to be a challenge. It is fundamentally important to facilitate training and ensure that it is as close as possible to the real environment.

Going beyond the current approach

Large and heavy legacy deployable tower solutions have been in use for some time now. This approach, however, cannot keep up with the new demands and challenges.

These aging and cumbersome mechanical platforms fall short in a number of areas, including:

- Large risk of attack by enemy forces in contested environments
- Lack of flexibility to support dispersed forward-operating locations
- Limited situational awareness and increased fatigue due to restricted operating height and a non-ergonomic work environment
- Difficulty and cost of training and simulating deployable digital tower environments
- Restricted operations if visibility is limited, e.g. in harsh weather conditions.

Harnessing the latest technology

Deployable digital towers offer a much better alternative to ensure safe, orderly and expeditious management of air traffic for out-of-area missions, without compromising on safety, security, quality or comfort.

A best-practice solution will typically consist of three main components: a trailer and mast system that hosts a camera and optical sensor system; a communication network; and a control cabin hosting data centre and working positions. It will include a digital tower visualization solution as well as all other required ATC solutions (including voice communication system, radios, meteorological services, recording, tower simulation, air situation, sensors, and more).

The movable mast equipped with cameras and sensors will naturally be placed near a runway or airfield. Meanwhile, the control unit can be located anywhere, for example in military camps or other customer-defined infrastructure. Separating mast and working position in this way augments crew safety and adds strategic command advantages through increased location flexibility.

Enhanced visual perception

Digitalisation will also reduce workload and improve safety for air traffic. Defence forces can take advantage of the latest technologies to enhance vision and situational awareness, including Pan-Tilt-Zoom cameras, thermal cameras, augmented reality, automated object tracking, surveillance integration, and modern touch-based user interfaces.

The digital representation of the out-of-the-window view needs to perfectly replicate—and even enhance—what can be seen with the naked eye. A best-practice solution will be able to deliver a clear 4K-resolution view that stitches and harmonises the input from multiple cameras, without overlaps or duplication, and with realistic image warping at a minimum framerate of 30 FPS.

Advanced visual and thermal sensors, together with artificial intelligence, improve vision in adverse weather and at night. Object detection and tracking for planes, drones and wildlife can improve alertness, and cameras can capture areas that were invisible before. A best-practice solution can augment video with overlays to reduce heads-down time and accelerate training.

Fully auditable recording

A digital tower system should also include comprehensive data and voice recording and review, enabling use for after-action review and investigation, and supporting more effective training and simulation. Such a system enables seamless integration with tower simulators, enabling trainees to experience ATC processes and workflows in the very same physical setup. In addition to saving time, cost and resources in training, this is likely to deliver improved safety.

Optimised for cost-effective rollout and operation

All equipment for a deployable digital tower should be optimised for durable, low-maintenance operation in all weather conditions, minimising ongoing maintenance cost. The system should avoid rotating parts for easier maintainability and all key functionalities should be redundant. Equally, it should meet all relevant ATC standards and be transportable by aircraft (e.g. C-130) or by land, rail and sea in standard shipping containers.

In addition, the solution should be supported by a robust network that automatically and proactively responds to any impairment by applying intelligent traffic routing and application control, with the aim of maintaining full availability for the remote digital tower.

To maximise flexibility and minimise deployment time and risk, organisations should choose an experienced vendor with a strong reference base in both compact digital tower systems and ATC. The provider must be able to demonstrate a proven solution, easily tailored to any operational needs (size, working positions, camera options, ATC system integration, and so on). The solution should include all necessary components (platform, screen assembly, furniture, power supply, and so on) and be based on a technical architecture that allows flexible scaling to any current or future requirements, including small-footprint deployments.

Combining safety with effectiveness

Forward-operating deployable digital towers provide high-quality air traffic control when conventional towers are out of service, and protect operators during times of crisis or in hostile areas. Through digitalisation, defence forces can improve situational awareness, reduce controller workload, and improve safety for air traffic.

The benefits of modern deployable digital towers include:

- Increased crew safety and more secure operations
- Greater flexibility, including more efficient personnel placement
- Greater ease in establishing contingency solutions
- More effective simulation, training and post-processing reviews
- Reduced number of boots on the ground during mobile deployments
- Increased visibility above ground level versus conventional mobile tower systems (up to 80 feet compared to 20-30 feet)
- Increased situational awareness through IR, night vision and/or augmented reality, helping improve operational safety for flight and ground staff
- Compact airlift footprint and rapid deployment, reducing vulnerability
- More comfortable working positions compared to standard solutions, reducing fatigue

Frequentis capabilities

Frequentis is the global leader in deployable digital tower solutions for military ATC. Drawing on more than seven decades of ATC experience, we are the only company offering mature, field-proven deployable digital tower solutions that help military customers ensure mission success and create command advantages. Please contact us for more information or to discuss your specific military ATC requirements.

About Frequentis

Frequentis, headquartered in Vienna, is an international supplier of communication and information systems for control centres with safety-critical tasks. Such 'control centre solutions' are developed and marketed by Frequentis in the business sectors Air Traffic Management (civil and military air traffic control, air defence) and Public Safety & Transport (police, fire brigade, ambulance services, shipping, railways).

As a global player, Frequentis operates a worldwide network of branches, subsidiaries and local representatives in more than 50 countries. Products and solutions from Frequentis can be found in over 30,000 operator working positions and in approximately 140 countries.

Founded in 1947, Frequentis considers itself to be the global market leader in voice communication systems for air traffic control with a market share of around 30%. In addition, the Frequentis Group's AIM (aeronautical information management) and AMHS (aeronautical message handling) systems, as well as GSM-R systems for Public Transport are industry-leading global solutions. The shares of Frequentis AG are traded on the Vienna and Frankfurt Stock Exchange under the ticker symbol FQT (ISIN: ATFREQUENT09).

For more information, visit www.frequentis.com

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