CSG

CSG MAESTRO Digital Tower

DEVELOPED BY ATRAK

Aerospace & Defence Electronics

CSG: Enabling the Future of Digital Towers

CSG – Europe's leading defense group – consolidates Czech ATM expertise for end-to-end airspace solutions worldwide.

- 130+ radar systems worldwide
- Eurocontrol EMS 4.0 radars
- ATM and UTM platforms
- Digital Remote Tower technology

MAESTRO – Mastering Digital Tower Operations

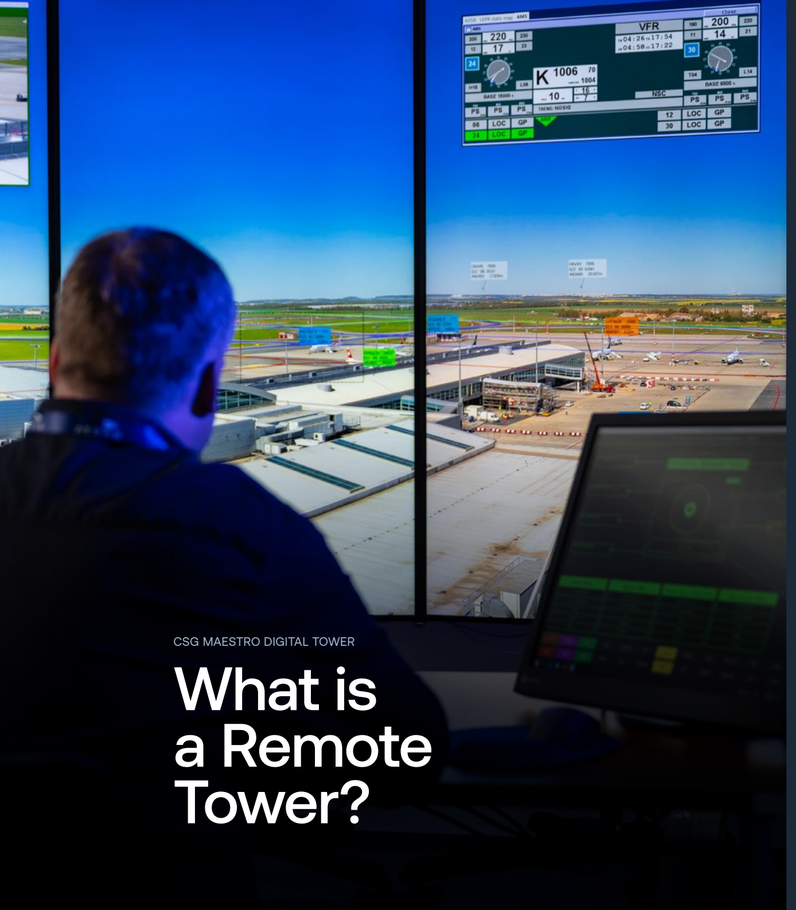
Transforming airspace management globally

Introducing MAESTRO – a Digital Remote Tower solution engineered by ATRAK, a CSG member company, for airports demanding high performance and agile scalability.

MAESTRO delivers seamless remote visual control from any location, combining proven reliability with intelligent airspace management.

Extending CSG's ATM expertise into digital towers, it enhances safety, efficiency, and operational flexibility.

From single-runway airports to multi-site control centers, MAESTRO ensures precise, coordinated operations – redefining remote tower performance for modern airspace.



CSG MAESTRO DIGITAL TOWER

What is a Remote Tower?

Understanding Remote Tower Technology

A Remote Tower is a next-generation air traffic control system that enables Air Traffic Controllers (ATCO) to manage aircraft operations and ground movements from a centralized location, away from the physical airport site.

Using advanced camera systems, sensors, and digital visualization, controllers maintain the same – or enhanced — situational awareness as in traditional tower operations.

Core Concept

Instead of operating from a physical tower at the airport, controllers work from a modern control center equipped with high-definition camera feeds, real-time surveillance data, and integrated automation tools.

This approach removes the need for costly tower infrastructure while increasing operational flexibility and maintaining high safety standards.

Key Advantages Over Traditional Towers

- Cost Efficiency
- Flexibility
- Modern Working Environment
- Scalability
- Safety Enhancement
- Contingency & Resilience
- Future-Ready

How It Works

1. **Visual Capture:**
   High-definition cameras provide up to 360° coverage of runways, taxiways, apron areas, and surrounding airspace
2. **Data Integration:**
   Camera feeds integrate with ATM systems (SDPS, FDPS), surveillance radars, and sensors
3. **Digital Presentation:**
   Information is displayed on controller workstations with intuitive interfaces, overlays, and zoom
4. **Real-Time Control:**
   Controllers manage traffic and issue clearances using standard procedures
5. **AI Augmentation:**
   Machine learning supports object recognition, risk detection, and decision-making
6. **Redundancy & Backup:**
   Failover systems and network redundancy ensure continuous operations

Remote Towers are rapidly becoming the standard for modern airports.

CSG: Proven Airspace Management Expertise

Proven Expertise Managing Real Airport Traffic

CSG brings unparalleled legitimacy to digital tower development through decades of airspace management expertise. Our brands have delivered proven solutions across 35+ countries, managing complex airspaces with radar systems and ATM platforms for civil and military operations worldwide.

This global experience directly powers our Czech deployments, where we've successfully developed advanced HMI solutions for regional airports, leveraging the same proven flight data processors used at Prague International Airport for efficient live airspace management.

MAESTRO naturally extends this proven foundation – adding seamless remote video capability to our established HMI and data processing platform. The result: complete Digital Remote Tower solution built on software already managing real airspace operations.

CSG MAESTRO DIGITAL TOWER

Our Vision: Compact, Adaptable, Scalable

MAESTRO – Production Capability for Airports of All Sizes

CSG's MAESTRO Digital Remote Tower delivers production-grade capability optimized for regional and mid-size airports while scaling seamlessly to larger operations. We address unique challenges with simplicity, adaptability, and cost-effectiveness– never compromising safety or performance.

MAESTRO scales effortlessly from single-airport contingency to multi-site control centers, delivering performance with regional agility.

AI Speech Recognition

Provides controllers with real-time transcription and safety alerts, enhancing situational awareness and preventing communication errors.

MAESTRO Design Principles

Compact Architecture

- Single module footprint: 5 × 5 m
- 4–12 screens with 120–360° coverage, tailored to airport needs
- U-shaped workstation enables efficient multi-airport operations
- Scalable camera masts adapt to terrain and weather conditions

Adaptability to Any Environment

- Designed for extreme conditions (temperature, wind, humidity, dust)
- Night-optimized cameras ensure consistent performance
- Seamless integration with existing ATM systems
- Supports contingency and backup operations

Scalability

- One control center can manage multiple airports
- Scales from single runway to multi-airport operations
- No system replacement required when expanding
- One workstation can control up to 3 airports

AI Speech Recognition & Communication Analysis

- Real-time transcription of controller–pilot communication
- Procedural alerts enhance situational awareness and safety
- Detection of communication errors and deviations

AI-Enhanced Object Tracking

- Fusion of optical and radar data for accurate tracking
- Detection of low-visibility or small objects
- Continuous tracking across sensor zones

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Technical Architecture

Production-Grade Remote Tower Platform

Comprehensive 360° Visual System

High-definition fixed cameras (4K resolution, 30 fps) deliver primary runway, taxiway, and apron coverage with up to 360° field of view. PTZ cameras (30× optical zoom) provide detailed inspection, while additional infrared/thermal features ensure superior vision at night and during harsh weather conditions. Optional panoramic 180° moving view lets customers use 180° or 120° screens while covering full 360° – switch smoothly to any angle as needed. Adaptive camera masts optimize coverage for site-specific terrain and ICAO obstacle limitations.

AI-Enhanced Data Fusion Layer

Seamless integration with existing ATM infrastructure plus direct interfaces to surveillance sensors. Machine learning fuses optical and radar data to create single authoritative tracks for all objects – detecting small aircraft, ground vehicles, and equipment beyond radar range. Automatic track continuity maintains precision across sensor coverage transitions.

Advanced Controller Working Environment

Configurable multi-display workstations (4–12 screens, 120–360° coverage) with intuitive graphical HMI featuring dynamic overlays (runways, taxiways, compass, range markers). Touch-enabled controls support modern interaction, electronic flight strips, role-based access (ATCO, supervisor, ground), and integrated safety nets—runway incursion detection, pushback violation alerts, no-communication monitoring.

Mission-Critical Network Architecture

Redundant network paths with adaptable primary bandwidth (driven by local environment capabilities and requirements). NTP frame-by-frame timestamping eliminates video discontinuity during failover. Real-time monitoring detects latency (<100 ms), jitter, and packet loss with automatic quality alerts. Embedded simulation, scenario replay, and 30day video/audio recording support training and incident analysis.

CSG MAESTRO DIGITAL TOWER

Prague Airport: 18+ Months Real-Environment Development

Developed in live Prague International Airport environment – fully connected to real-time surveillance, communication systems, and operational data streams. This intensive 18+ months development and testing provided invaluable real-world experience from one of Europe's busiest international hubs.

Real-environment validation:

- Seamless integration with live ATM infrastructure
- High-density traffic scenarios (multi-runway operations, peak hours, diverse aircraft types)
- 24/7 conditions including night operations, weather variations, and contingency procedures
- Continuous live data refinement of AI object tracking, automated safety alerts, and PTZ camera controls
- Engine start-up audio confirmation, using our AI Speech recognition solution
- Communication recording with automated transcription
- Additional statistics about taxiways use, using our AI-Enhanced Data Fusion Layer
- Report on radio frequencies usage during peak time activities

Proven system maturity from authentic operational environments.

Beyond-ATM applications discovered:

- De-icing procedure verification and documentation, using visual detection
- Ground vehicle movement monitoring and conflict detection, using our AI-Enhanced Data Fusion Layer

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Maintenance & Support Strategy

Field-Maintainable Modular Architecture

Quick-disconnect cameras enable unit **replacement in under 30 minutes** without system interruption. **Standard commercial components** – servo motors, IT hardware, networking– eliminate specialized expertise requirements and ensure spare parts availability.

Comprehensive 2-year warranty (extendable to 4 years based on environment and needs) includes remote diagnostics for early issue detection, staged software deployments to minimize disruptions, and scheduled preventive maintenance to maximize system uptime.

Engineered for operational continuity and controller confidence.

CSG MAESTRO DIGITAL TOWER

CSG: Industrial--Scale ATM Expertise

Established Industrial Foundation

Supported by a leading industrial group with extensive aerospace and defense expertise across more than 70 countries, providing substantial resources for mission-critical air traffic management deployments.

Proven Global ATM Capability

Over 30 years of delivering radar, ATM, and surveillance systems at major international airports throughout Europe, Asia, and Africa, demonstrating comprehensive operational knowledge and 24/7 system reliability.

Preeminent Certifications and Compliance

Certified to ISO 9001 and ISO 27001 standards; approved by CAA Czech Republic for live ATM operations; EASA DPO certification process – maintaining leadership in regulatory compliance.

Guaranteed Execution Capability

Industrial-scale resources, proven global deployments, and advanced certifications ensure delivery of mission-critical ATM solutions meeting the highest operational and regulatory standards.

Aerospace & Defence
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Ready to transform your airspace operations?

Contact CSG for a MAESTRO site assessment and regulatory consultation.

We'll evaluate your airport's requirements and define the fastest path to implementation.

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