



Aero4TE

TE VOGS

SUPPORT OF TRAFFIC SAFETY AT AIRPORTS

...the choice for every airport operation unit

LETIŠTĚ PRAHA a.s. / Prague Airport
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Číslo licence: 144

INTRODUCTION

MANEUVERING AREA OF AN AIRPORT

= Mixed traffic of aircrafts and airport vehicles

TEVOGS

= Vehicle Onboard Guidance System
with navigation and communication functions
= System solution to improve situational awareness
of airport traffic

- Fully compatible with EUROCONTROL concept of airport communication
- AeroMACS certified version
- A wide range of utilities enhancing the basic situational awareness functions



BACKGROUND

(TEVOGS is an AeroMACS product)

- FCI - Future Communication Infrastructure was proposed in Action Plan 17 and in COCR (Communications Operating Concept and Requirements...)
- The requirements for airport surface applications as a part of FCI were defined:
 - mobile WiMAX (IEEE802.16e)
 - frequency band 5091- 5150MHz
- The AeroMACS Standard for airport surface applications was developed to the defined setting of WiMAX (IEEE802.16e)
- The AeroMACS standard and products are starting to be implemented throughout the world



INTENTION OF USE

- The TEVOGS system has been developed as a traffic management network for tracking, supervision, real-time navigation, two-way communication and efficient operation of airport vehicles/airport staff, for all areas of safety relevance.
- It is a system to increase the safety and efficiency of mobile units operating in any weather conditions including extremely low visibility conditions, such as snow, rain, fog.....
- Real-Time Navigation, Dual mode Comm features are designated to prevent accidents, to save your staff time, to increase efficiency. This leads to a decrease in a budget of your airport once the system has been installed and staff have been trained



FLEXIBILITY

- The TEVOGS system is open to integration with other safety and information systems used at the airport
- The TEVOGS system is designed to fit with the existing environment and offers a number of adaption features in order to be integrated into your airport operation room surveillance
- The TEVOGS system can be customized



VERSIONS

- **TEVOGS - AeroMACS certified version**
 - WiMAX version of TEVOGS system
 - Fully prepared for future AeroMACS infrastructure
- **TEVOGS - Light version**
 - LTE version of TEVOGS system
 - Economical, easy to deploy, but not AeroMACS certified

WiMAX vs. LTE versions differs in the type of wireless network and differs in roof unit (different WiMAX vs. LTE transceiver).

SECURITY ASPECTS

- Remote SW components (commonly known as client components)
 - Authentication based on RSA key pairs
 - End-to-end communication encryption
- Client access control
 - Client roles with restricted set of permitted operations
 - Dynamic client role assignment
- Mobile unit HW
 - SSH access
 - Read-only SNMP access
 - Wi-Fi hotspot protected by WPA2
- AeroMACS network
 - Key Management Protocol
 - Device/User authentication
 - Control Message Protection
 - Support for high-speed sessions

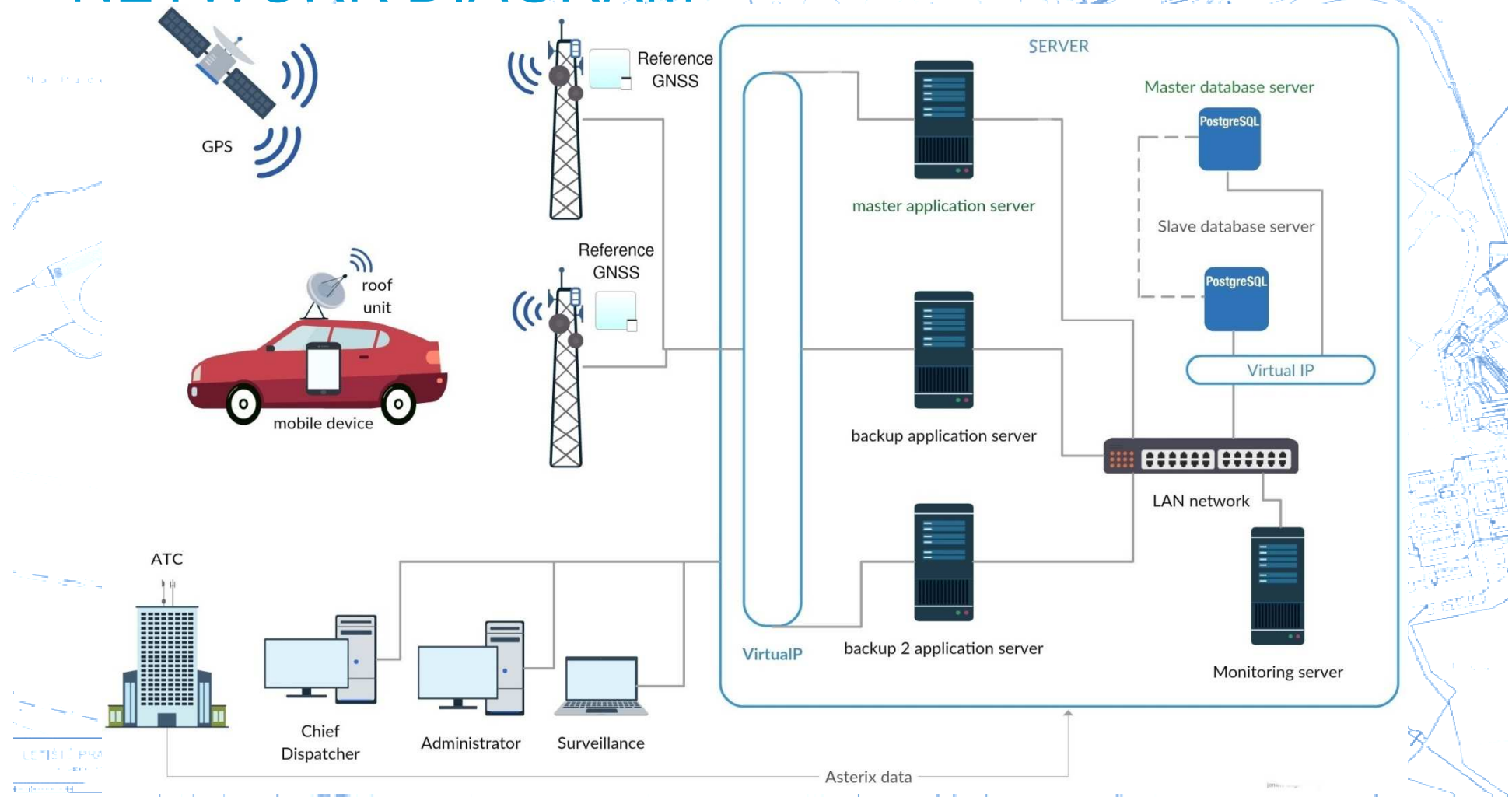


COMPONENTS

- **TEVOGS Server**
Processing data
- **TEVOGS Dispatcher**
Management of TE-VOGS, different levels of authorization
- **TEVOGS Mobile Client**
Mobile clients for vehicles. Can be also used as static client
- **TEVOGS Reference GNSS station (option)**
For improvement of accuracy an speed of GNSS cold start
- **Wireless Network**
AeroMACS (WiMAX) or LTE



NETWORK DIAGRAM



PHILOSOPHY OF OPERATION

Each mobile client has a status in the TEVOGS system. The system handles clients according to its status.

Status of the client:

- IDLE** - switched off or without connection to the system
- READY** - switched on, with position, with connection to the system
- INSERVICE** - switched on, with position, authorized in TEVOGS
- WARNING** - some parameters at decreased level
- ERROR** - some features failed (loss of position, loss of connection,...)

Changeover of status:



CLIENT STATUS AND ITS REPRESENTATION

State name	Service	Position	Communication	Toolbar graphics
IDLE	OUTofSERVICE	NO	NO	☰ Map IDLE
ONPOSITION	OUTofSERVICE	OK	NO or POOR	☰ Map ONPOSITION
ONLINE	OUTofSERVICE	NO or POOR	OK	☰ Map ONLINE
READY	OUTofSERVICE	OK	OK	☰ Map READY
INSERVICE	INSERVICE	OK	OK	☰ Map INSERVICE
WARNING	INSERVICE	POOR	OK	☰ Map WARNING
WARNING	INSERVICE	OK	POOR	☰ Map WARNING
ERROR	INSERVICE	NO	OK	☰ Map ERROR
ERROR	INSERVICE	OK	NO	☰ Map ERROR
ERROR	INSERVICE	NO	NO	☰ Map ERROR

BASIC FUNCTIONS

- Real-time own position and real-time position of all the TE-VOGS clients
 - Real-time position of aircrafts and vehicles from the system A-SMGCS
 - RWY Proximity Alerts (prevention of RWY incursions)
 - Area Alerts (temporarily closed TWYs etc.)
 - Points of Interest
 - Messaging function
 - Low Visibility Procedures Information
 - Test utilities
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- Automatic updates of client stations (maps and software) are performed via network

ADVANCED FUNCTIONS

- Crossing function
(improved safety when crossing TWY)
- Navigation function
(the teams and workers can be navigated precisely to the point of incident or to the point of their work)
- Data storing and archiving
(all geotracking, positioning and timestamp data)
- Data analysis and data mining
(operation optimization)

MOBILE CLIENT

- **Mobile (vehicle) Client = Roof unit + Mobile device**
- **Connection between the Roof unit and Mobile device: WiFi**
- **Components:**
 - Roof unit: AeroMACS (WiMAX) or LTE
 - Mobile device: Android OS tablet or mobile phone (rugged types recommended)
 - Mobile device holder: BRODIT or other brand of car holders
 - Security strap with power feed

MOBILE CLIENT - PHOTOS

- Roof unit with with magnetic holder, security strap with power feed and with LED indication of status
- Mobile device in BRODIT car holder



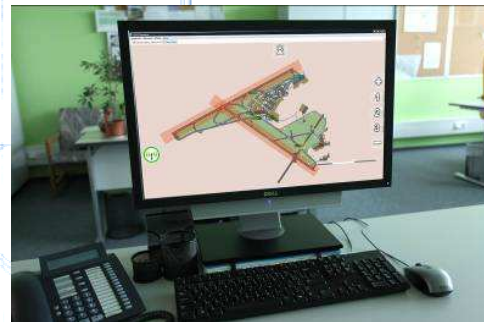
DISPATCHER CLIENT

Dispatcher versions:

- Administrator
- Chief dispatcher
- View-Only dispatcher for surveillance

Dispatchers of professional groups

- Maintenance
- Fire brigade
- Fuel supply
- Birdwatchers
- Xy



BASIC FUNCTIONS IN DETAIL

examples: Maps, Toolbar and Menu



Figure: Application toolbar - landscape mode

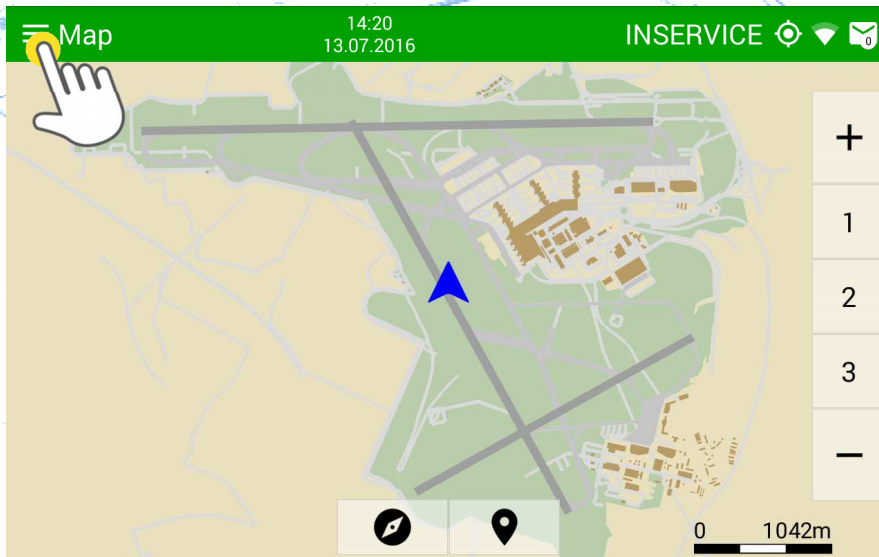


Figure: Map screen
Application toolbar - landscape mode

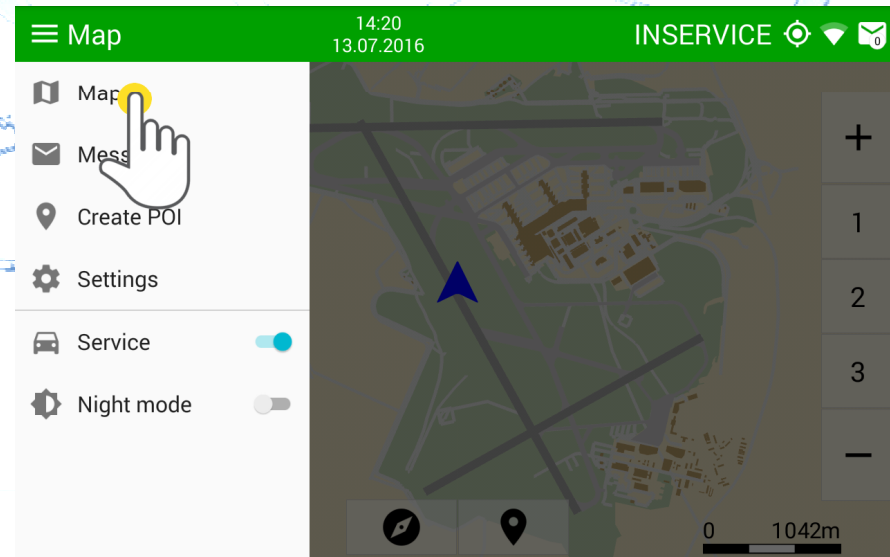


Figure: Map screen – night mode
With Application menu

BASIC FUNCTIONS IN DETAIL

examples: Messages

- Messages between user and other users, group of users, dispatcher
- Predefined messages
- Three message priorities

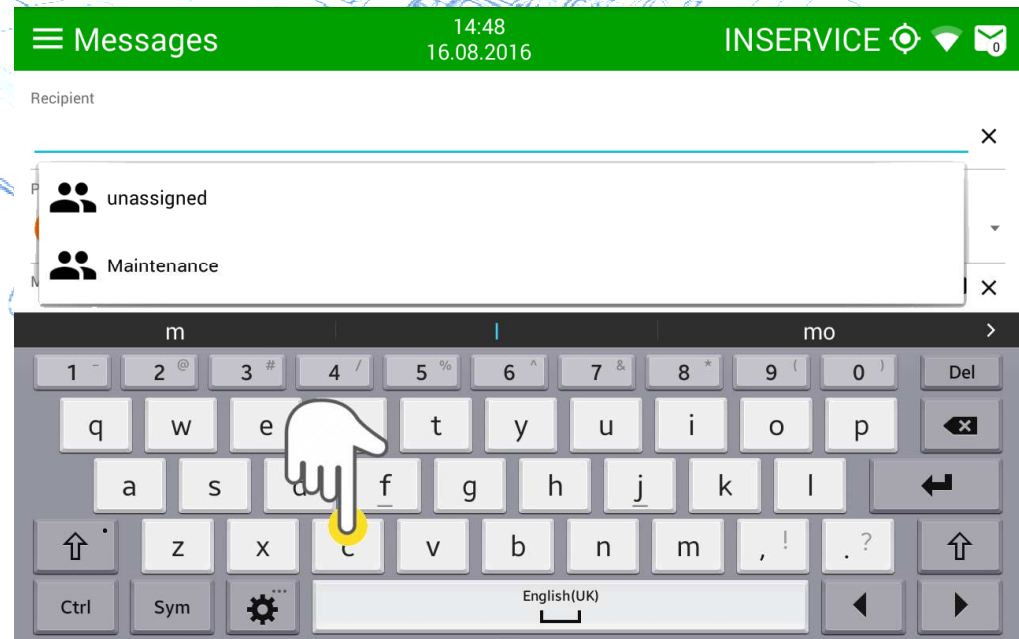


Figure: Message screen and selection of the recipient

BASIC FUNCTIONS IN DETAIL

examples: POIs (Points of interest)

- Easy to create POI
- Default categories of POIs
- Possibility to create message with reference to the POI

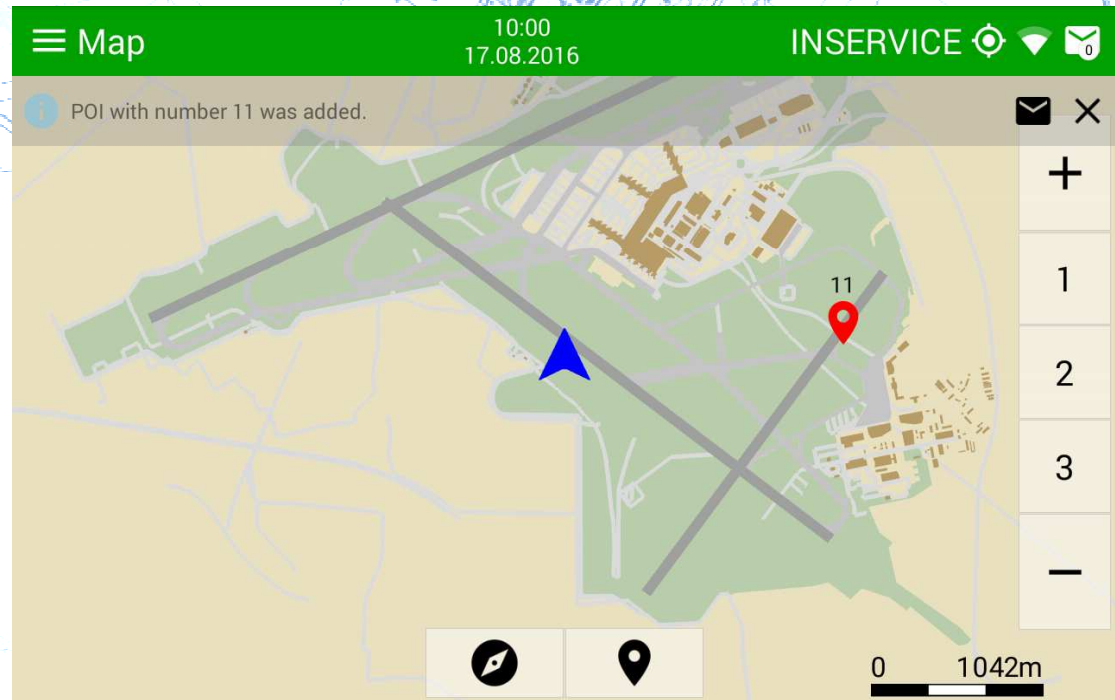


Figure: Created POI no.11

BASIC FUNCTIONS IN DETAIL

examples: Closed Area

- The dispatcher has the possibility of setting ad-hoc perimeters to restrict mobile units to enter such perimeters, with the exception of rescue or other specific teams.
- Notification is displayed on mobile client display
- Notification cannot be closed by the user.
- Notification is closed when the area is left.



Figure: Closed area

PRAGUE AIRPORT

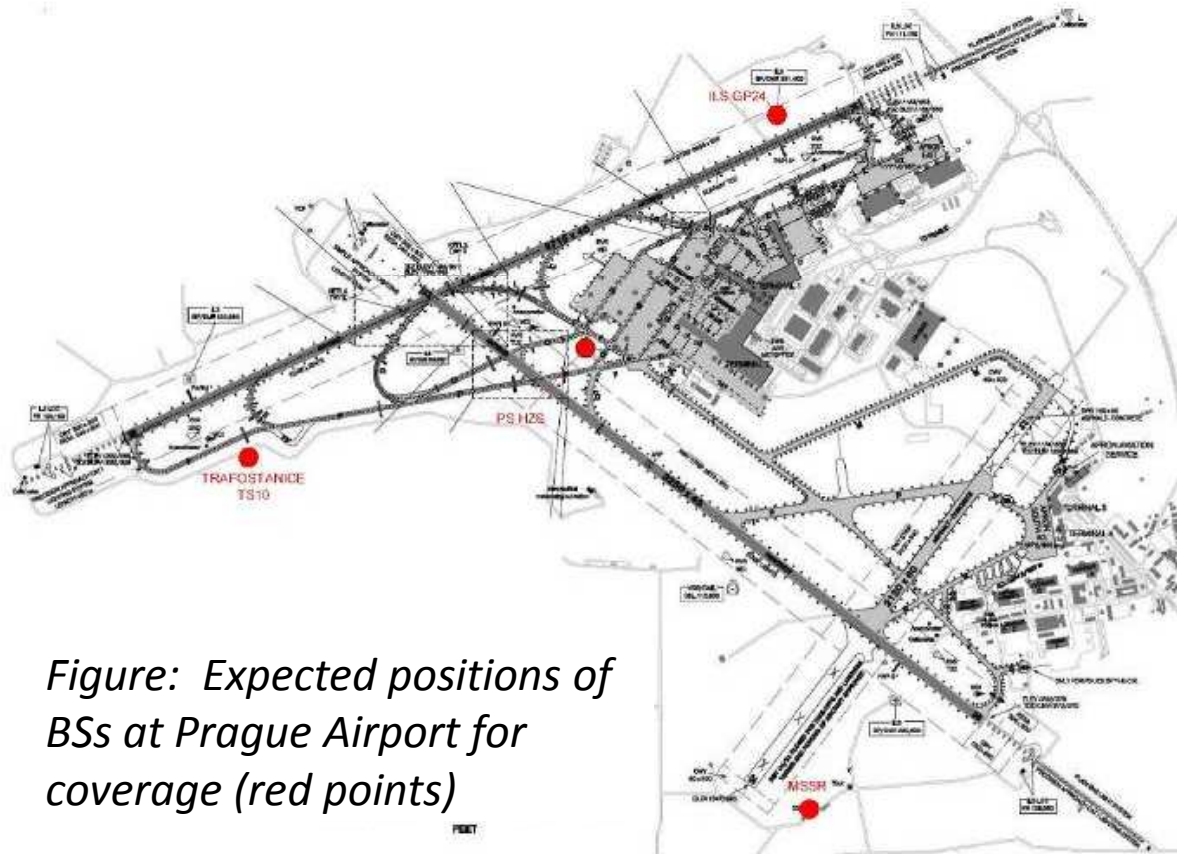


Figure: Expected positions of BSs at Prague Airport for coverage (red points)



Figure: Installed BS with antenna



TEVOGS - IN FIELD

“TEVOGS has the ambition to become one of the pillars of operating safety of mobile vehicles at airports. This system offers new functions and capabilities, may contribute to more efficient exploitation of mobile units as well as to expediting and facilitating the work of airport operating personnel. TEVOGS is a system solution, which in compliance with the SESAR plans and projects will mean a significant support of traffic safety at airports.”

Ing. Libor Kurzweil, Ph.D., Director of Quality, Safety and Processes Management. Prague Airport, Czech Republic

Prague Airport and Air Navigation Services of the Czech Republic provide consultancy support and access to testing of TEVOGS on Vaclav Havel Airport Prague.



TEVOGS - 3rd place in European Satellite Navigation Competition 2012



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TE VOGS

- ✓ Design and Development
- ✓ Manufactory
- ✓ Installation
- ✓ Maintenance

Thank you for your attention.

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