DIGITAL RUNWAY INCURSION WARNING SYSTEM – DRIWS

With its groundbreaking application of modern technology, DRIWS reduces the risk of Runway Incursions at all types of airports. In addition, DRIWS is a cost effective and flexible system that provides opportunities for further digitalisation of airports – without compromising safety.

REDUCES THE RISK OF RUNWAY INCURSION

DRIWS consists of vehicle devices and a display unit in the tower. Position and data are transferred in real time from the vehicle devices to the control tower, with up to 10 updates per second.

DRIWS uses Geofencing to mark out zones where runway incursion alarms are to be positioned (runways, etc.). Since the system is flexible and configurable, area settings can be adjusted by the system operator for adaption to specific experiences or changes to regulation/infrastructure.

When a driver approaches a zone that requires authorization from air traffic control, the vehicle device will alert the driver. If clearance is not received from the air traffic control and the vehicle continues into the next alarm zone, DRIWS will register a runway incursion and the associated alarm signal will be triggered in the vehicle device. An alarm is also triggered if a vehicle leaves the runway area without informing air traffic control.

The system logs can be used to underpin flight safety procedures as well as the reporting and investigation of incidents.

MORE EFFICIENT AIRPORT OPERATIONS

DRIWS creates many opportunities for safer and more efficient airport operations. For example, DRIWS can replace road holding position lights at entrances to runways. The cost of installing traditional traffic signals greatly exceeds the cost of introducing DRIWS, which contains a "mobile digital road holding position light".

As the driver approaches a holding position, a red light with the associated signal is indicated by the vehicle device. When air traffic control has authorized the vehicle to enter the runway area a green light will appear.

Another benefit is the ability to automatically transmit braking action reports to air traffic control, where DRIWS with associated interface will receive and transfer data without manual input.

FROM RESEARCH TO A WORKABLE SYSTEM

The prototype for DRIWS was developed as a research project through a collaboration between RISE Viktoria (part of Research Institutes of Sweden) and Air Navigation Services of Sweden, LFV. Combitech, part of the Saab group, further developed DRIWS into an operational system, ready for use at all types of airports.

THE DRIWS SYSTEM

The cost effective DRIWS system consists of the following parts:

- Vehicle Presentation Units, used by the drivers
- Global Navigation Satellite System (GNSS) with position correction as Real Time Kinematic (RTK) to get cm accuracy
- Display Units, used by any airport personnell
- Display Units, used by tower operators
- Cellular or radio communication to vehicles for data transfer


VEHICLE PRESENTATION UNIT

The display unit for vehicles is an Android phone or tablet. This unit shows a stop light and additional information to the driver. The presentation unit also gives visual alarm and warning sounds to the driver. The warning alarm is to alert the driver that the ground vehicle is inside the warning area and immediate actions may be required to move away from this area.

The system is also capable of giving caution alarms that indicates attention but no immediate action is required.

DISPLAY STATUS
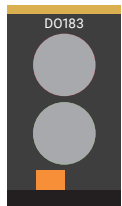
OUTSIDE GEOFENCE

Vehicle is outside the geofenced area. The yellow POS lamp indicates that the position quality is low. This lamp should normally be off.

STOP CLOSE TO GEOFENCE

Vehicle is at the stop positions close to the geofence. The driver should contact the tower to get clearance to proceed on to the runway.
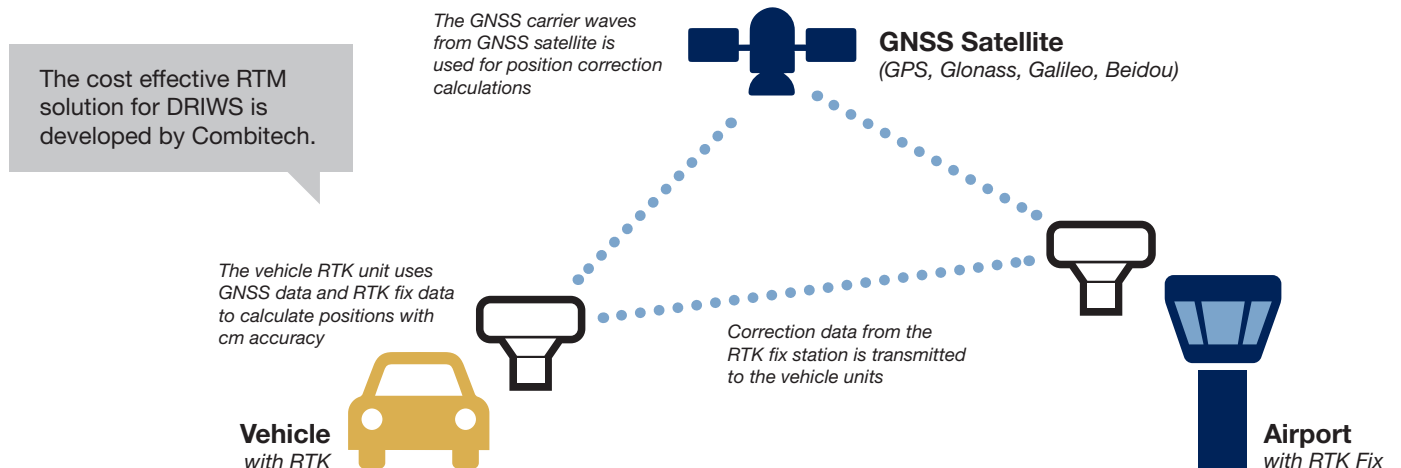
ACCESS GRANTED

Vehicle is granted access to drive to the geofenced area. The yellow LVP lamp is turned on to indicate that low visibility procedures are active.

RUNWAY INCURSION

Vehicle has made an runway incursion, and the upper and lower lamps are flashing orange while an alarm sound is playing. This is not turned off until the vehicle has left the runway geofenced area.

GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS) WITH POSITION CORRECTION

The GNSS carrier waves from GNSS satellite is used for position correction calculations

GNSS Satellite
(GPS, Glonass, Galileo, Beidou)

The cost effective RTM solution for DRIWS is developed by Combitech.

The vehicle RTK unit uses GNSS data and RTK fix data to calculate positions with cm accuracy

Correction data from the RTK fix station is transmitted to the vehicle units

Vehicle
with RTK

Airport
with RTK Fix

DISPLAY UNITS FOR AIRPORT SITUATION AWARENESS

A cost effective display system can be used at the airport or remote to display the current vehicle positions. The display system consists of an Android media box and a monitor.


TOWER CONTROL SYSTEM

The tower control system is used by the tower operators in Supervised mode to grant or revoke access to the geofenced areas by switching the stop light color in the vehicles from the controlling software.

The controlling software has adminstration functions for setting up and adjust geofences and to add and remove users to the system.

The controlling software can be run separately or as an integrated part of an existing system.
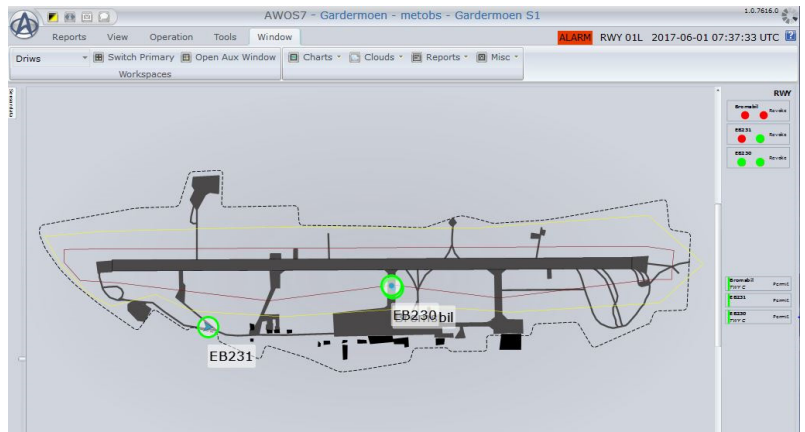
HISTORY LOG

All vehicle movements are logged for future analysis. A tool is avaliable where vehicle positions can be shown at any point backwards in time and it is also possible to play a stored sequence of vehicle movements. A heat map is available that shows common vehicle positions the selected time period.
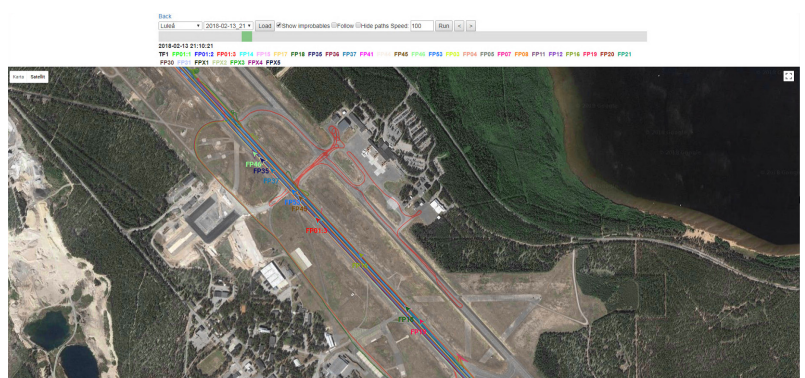
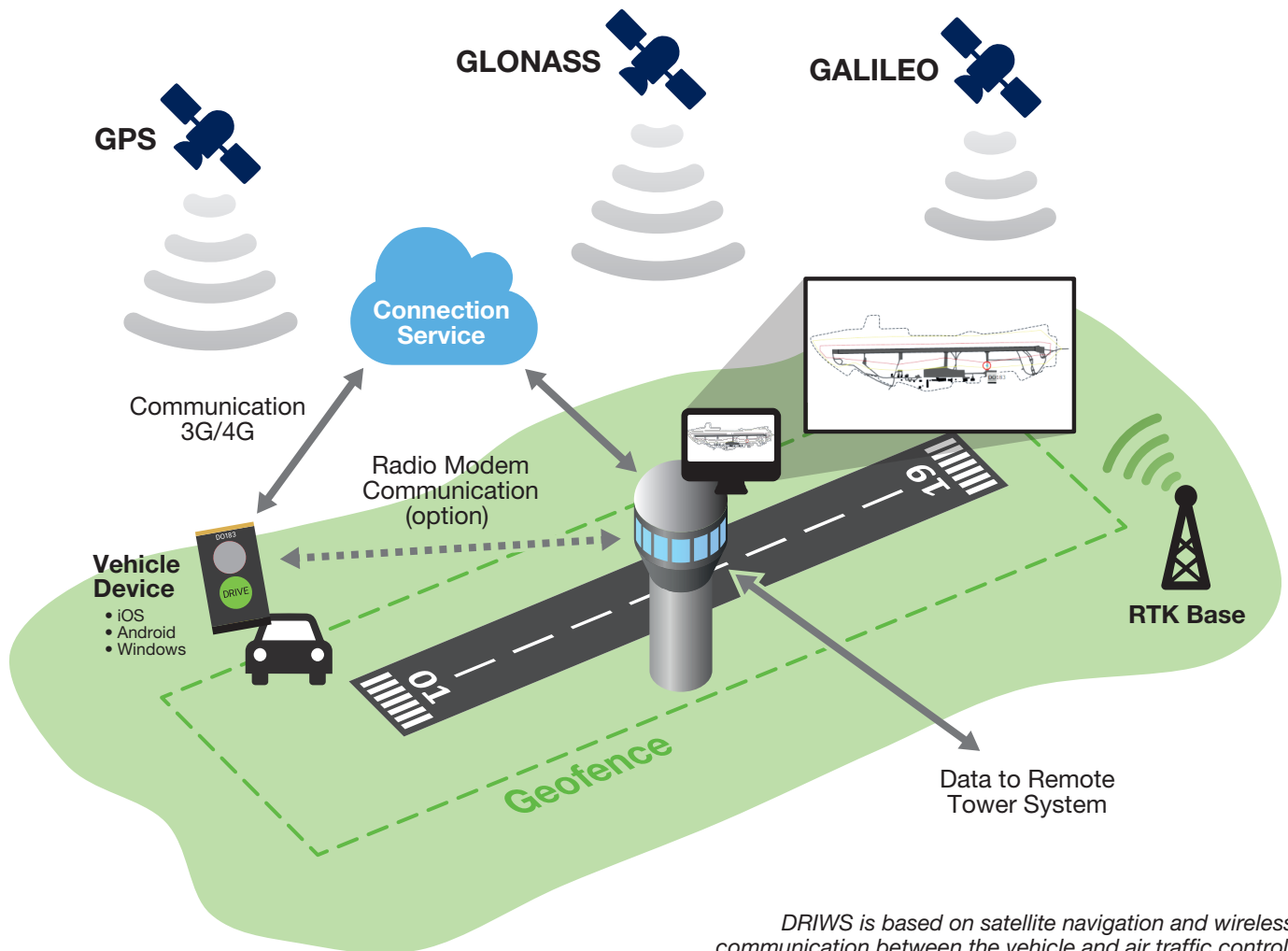
ADDITIONAL FEATURES AND FUNCTIONS

The DRIWS system has an Autonomous mode that can be used during hours when the tower is closed. The vehicle presentation unit will handle geofences, show stop lights and give alarms for runway incursions.

Access to geofenced areas is given when normal stopping routines are followed without the need for tower interaction for access clearance.

Center line following helps drivers by utilizing the GNSS data and a predefined runway centerline. This is an indispensable function for winter snow removal or other runway tasks performed during low visibility conditions.

The indicators for center line following is the yellow and blue arrows on the vehicle presentation units.

GPS **GLONASS** **GALILEO**

Connection Service

Communication 3G/4G

Radio Modem Communication (option)

Vehicle Device
• iOS
• Android
• Windows

RTK Base

Geofence

Data to Remote Tower System

DRIWS is based on satellite navigation and wireless communication between the vehicle and air traffic control.

FEATURE HIGHLIGHTS FOR DRIWS

COST EFFECTIVE
• Full logging and reporting of Runway Incursions
• Modifiable geofencing and zones
• Very reliable and scalable system solutions
• User friendly and easy to learn
• Can be integrated into existing airport systems

DEVELOPMENT & QUALITY ASSURANCE
Software development and quality assurance according to RTCA 278/EUROCAE ED 109, EUROCONTROL ESARR 6, ISO 9001+ TickIT, ISO 14001, ISO 27001

HARDWARE
• Vehicle device (smart phone, tablet or vehicle computer)
• Inbuilt or external GPS for vehicle unit
• Communication via 3G/4G or radio modem
• Reference station for use of RTK positioning
• Server and display for air traffic control

PRECISION POSITIONING
Depending on positional accuracy requirements DRIWS can be equipped with simple GPS solutions providing accuracy up to a few metres, or RTK solutions, which provides stable centimeter level accuracy.

OPERATING SYSTEM
• Android
• iOS
• Windows

INTERFACES
DRIWS can be equipped with several types of interface including connections to Surface Friction Tester, Remote Tower System etc.

SUPPORT
DRIWS has an advanced function for remote support, to enable centralized trouble-shooting, configurations and updating of software.

For more information please contact driws@combitech.se.

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TECHNOLOGIES