DRIWS
DIGITAL RUNWAY INCURSION WARNING SYSTEM

Successful Collaboration – from idea to product

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DRIWS – THE CHALLENGE

➢ NEW REGULATION – JAN 2018
  - ALL ACCESS ROADS TO RUNWAY (RWY) MUST HAVE TRAFFIC LIGHTS CONTROLLED BY AIR TRAFFIC CONTROL (ATC)

➢ PROPOSED SOLUTION FROM AUTHORITIES
  - FIXED TRAFFIC LIGHT
  - FIXED CONNECTION TO ATC
  - FIXED POWER SUPPLY

➢ LIMITED ADDED SAFETY
➢ NO FUTURE POTENTIAL
➢ A LOT OF DIGGING!

LOWER COST THAN THE ALTERNATIVE
MUST COMPLY WITH NEW REGULATIONS
LIMITED TIME
DRIWS – THE CHALLENGE

➢ 40+ AIRPORTS IN SWEDEN
➢ VERY LITTLE DONE BY NOV 2015
➢ ESTIMATED COST / AIRPORT 1-2 MSEK

LOWER COST THAN THE ALTERNATIVE

MUST COMPLY WITH NEW REGULATIONS

LIMITED TIME
DRIWS – IN THE VEHICLE

TRAFFIC LIGHT INSIDE THE VEHICLE

ALL VEHICLES WITH GPS & CONNECTED
DRIWS – HOW IT WORKS

ELECTRONIC FENCES - GEOFENCING

VEHICLE MOVING INTO ZONES RECEIVE INSTRUCTIONS & WARNINGS
CONTROL OF ACCESS FOR GROUND VEHICLES TO RESTRICTED ZONES

ALL GROUND VEHICLES EVERYWHERE ALL THE TIME
DRIWS – FEEDBACK FROM DEMO

- Must be a dream for a flight traffic safety coordinator (Kristianstad – Österlen Airport)
- A very good alternative to solve the new regulations at a reasonable cost (F21 & Luleå Airport)
- Safer than stationary traffic lights… (Vilhelmina Airport)
- You have our full support in this project … (Jönköping Airport)
- … and many more …
Collaboration – research institutes / industry / regulators

Aviation industry
- Remote Tower Center
- Continuous focus on safety
- Cost for running airports
  - is automation an option?

The drivers:
- New EU / TS regulation
- Increasing number of RWYI

Research Institute
- Autonomous & Cooperative vehicles
- First live implementations
  - mines / parking lots….. and airports
Collaboration – research institutes / industry / regulators

Aviation industry
➢ On-going pre-study
➢ Automation on airports
➢ Viktoria invited to join
➢ Nov – Dec 2015

➢ Portfolio for research - aviation
➢ 10 year horizon 2014 – 2025

➢ Viktoria – application for funding
  ➢ Pre-study with partners (Feb – Apr 2016)
  ➢ Demonstrator (May – Aug 2016)
  ➢ Find alternative solution to fixed traffic lights
➢ DEMO AT UMEÅ AIRPORT SEPT 2016
Collaboration – research institutes / industry / regulators

- Discussions with LFV - new project ideas
- LFV with links to TrV for funding
Collaboration – research institutes / industry / regulators

- **HANDOVER TO INDUSTRY**
- Combitech uses Viktoria’s demonstrator as “specification” to build product
- LFV & Combitech form group to develop & market DRIWS
Collaboration – research institutes / industry / regulators

- Approval from regulator

Swedish Transport Agency

Swedish Regional Airports

Business side

Swedish Transport Administration

Research
Collaboration – research institutes / industry / regulators

SUCCESS FACTORS

➢ Common driver
  - Legal & financial
➢ Early involvement from all
➢ Transparency / information
➢ Selling the idea
➢ Demonstrator – not PP
➢ The right industrial partners
DRIWS – Digital Runway Incursion Warning System

Successful Collaboration – from prototype to product

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After the successful demo, the participants agreed that the concept should be further developed, produced and used.

LFV, among others, committed in the research phase and demo

LFV and Combitech decided to team up and transform the concept into a commercially available product

After less than five (5) months of development, the product **DRIWS 1.0** is installed at Umeå Airport in Sweden.
Agenda
– from prototype to product

Combitech in brief

Why did Combitech do this?

How did we do it?
• From prototype to product
  • Advantages
  • Challenges
  • Added features

Future potential

Q & A
Combitech in brief

- One of the largest Nordic technical consultancies
- Present in more than 30 locations in Sweden, Norway and Finland
- Digitalization, cyber security, defence etc.
- > 1 900 employees, > 50 years in the business
- Certified according to ISO 9001, ISO 14001, ISO 27001 and TickIT
- Independent subsidiary of Saab AB

A part of the Saab Group
Why Combitech?

- Technical skills and experience (System Integration, “new & old”)
- Project management and resources – tight schedule, tight budget!
- Safety and security capabilities
- Domain and market knowledge
RTC, Sundsvall SWE

Safety case

The world’s first operational Remote Tower System
Interaction between users (SwAF), owners (HQ), purchasers (FMV/DMA) and industry affects (determines?) project success

The system of systems perspective – system integration is the core
How did we do it?

- Combitech development based on:
  - The research results
  - Lessons learned from the demo
  - Further interaction with users and LFV
  - Domain knowledge and technical know-how
  - ATM relevant software development standards
  - Safety, cyber security, reliability, maintainability, etc.

- Advantages:
  - The end state visualised and tangible
  - Far more efficient than only using Requirements Specifications
  - Short lead times and “getting it right from the start”
    = Cost effective development
Main challenges

- **Economy**
  - Easy to build when money’s not an issue, difficult when it is...
  - Regional airports in Sweden lost ~375 MSEK in 2014
  - Costs need to be LOW and predictable (afford to equip all/most vehicles)

- **Solution**
  - Design the system with a mix of newly developed hardware and software and commercially available technology

- **Sufficient quality at low cost**
  - Ways of achieving accuracy, reliability and stability:
    - Verification points (initialization of vehicle devices)
    - Verification algorithms (reported position credible?)
    - Monitor, detect and alert when poor pos/comms
    - New HW (e.g. for RTK position correction signals)

- **Scalable and customisable system**
  - Adaptable to different sizes/types of airports and their needs (and funds...)

Quality vs. Cost

Compromise
DRIWS options/configuration

- **Vehicle device**
  - Smartphone/Tablet and/or Computer
  - Internal and/or external GNSS, with/without RTK, redundant sources
  - 3G/4G and/or radio modem

- **Central services**
  - Cloud service or exclusive servers
  - Stand alone server or integrated in AWOS7
  - Clients via LAN or web (read only)
  - Logging and alerts (incl. + ) of incursions

- **Positioning and communication:**
  - RTK base station(s)
  - Radio base station(s)
Configurable and flexible (extract)

- Turn, scale and zoom (default orientation = view from TWR)
- Add/modify layers and zones as needed
- Changes distributed to vehicle devices

- Geofencing in vehicle and central service
  → No position latency in vehicle
  → Offline mode (vehicle autonomous, e.g. when ATC closed)

- Multiple airports/runways
- Remote support
- Etc., etc.
What’s next?

- DRIWS available as affordable product – with a *smörgåsbord* of building blocks, suitable for all types of airports
  - Vehicle devices
  - Communication
  - RTK position correction
  - Server solutions
    (Options can be added at any time)

- Will be available as part of LFV service portfolio

- Start kit for (near) future possibilities and continued research
DRIWS – WIN-WIN

- PLATFORM FOR RESEARCH ON AUTOMATED VEHICLES
- CONTRIBUTE TO SWEDISH INDUSTRY
- SOLUTION TO AN URGENT PROBLEM
- PRODUCT FOR GLOBAL MARKET
- EFFICIENT USE OF FUNDING

PILOT TO PRODUCT
14 MONTHS
DRIWS – Future potential

POTENTIAL 2017-2018

- STOCKHOLM / ARLANDA AIRPORT
  - ALL GROUND VEHICLES
  - EVERYWHERE
  - COMPLEX VEHICLE MOVEMENTS
  - ADDITIONAL SAFETY NETS

- TEST-SITE Ö-VIK
  - LFV
  - SWEDAVIA
  - RISE VIKTORIA
DRIWS – Future potential

POTENTIAL 2017-2018

- “THE AUTONOMOUS AIRPORT”
- CONNECTED VEHICLES IS AN OPEN DOOR TO VEHICLE AUTOMATION
  - RUNWAY INSPECTION
  - FRICTION CONTROL
  - LAWN MOWING
  - SNOW PLOWING
  - SWEEPING
  - SURVEILLANCE
  - ……
Hur mycket information behöver vi…?