SWAIR – SPACE WEATHER IMPACT ON GNSS SERVICE FOR AIR NAVIGATION

Small ARTES 20 project
Team
Who we are

PRESENT TECHNOLOGIES
Project Leader & Management
Expertise in software development and integration

BLUECOVER TECHNOLOGIES
GNSS and Earth Observation data expertise, and space industry insight

CITEUC
Centre for Earth and Space Research of the University of Coimbra
Space Weather and geomagnetic data expertise

NAV PORTUGAL
Leading User
Aviation sector insight
Expertise in Air Navigation
Aviation
The Non-Space Market

• Air Navigation is gradually increasing GNSS based landing procedures support (e.g. using Satellite-based augmentation systems – SBAS), driven by the lower operational costs
  • Many of Europe’s small and regional airports cannot afford the high costs of installing and maintaining ground-based Instrument Landing Systems (ILS)
  • Others are planning to discontinue ILS due to budget constraints

• The investment made by US (in WAAS) and Europe (in EGNOS) anticipates the emergence and worldwide acceptance of this technology for aerodrome approaches
  • SBAS approaches are becoming operational at European airports after its wide application at US airports
Space Weather in Aviation

- Aviation has been one of the main drivers of Space Weather
  - ICAO identifies the need of regional Space Weather centres
  - EUROCONTROL has identified space weather as a potential problem for European air traffic management
- Aviation needs information that is easy to understand, coherent and, if possible, in real-time
  - The majority of space weather services do not provide specific industry solutions
- Air Navigation Service Providers (ANSPs) are interested in local monitoring of GNSS signal
The emergence of GNSS based procedures in Aviation requires an early warning and forecast service on GNSS signal discontinuities or degradations, specialized on Air Navigation at regional level.
SWAIR Project
Small ARTES Objectives

• Business opportunity validation with Aviation stakeholders
  • Update business plan with sales prediction and investment

• Correlate GNSS discontinuities with Space weather events, using data from Lisbon Airport / NAV Portugal
  • Raise awareness on the occurrence of solar events susceptible of causing discontinuities
  • Reach a demonstration asset for air navigation sales and assure the solution can be scalable
  • Increase customer’s confidence through validation (with NAV Portugal)

• Plan/Prepare a future Demonstrator project
Service Chain
Flow of value across the service chain

Local Sensors
- GNSS receiver
- Magnetometer

Processing and data fusion
- Collect real-time sensor data
- Archiving
- Sensor fusion

Air Navigation Services
- Operational Status monitoring
- GNSS Performance assessment
- GNSS Data recording

Main users
- ANSPs (controllers, procedures planning, supervisors)
- Medium size aerodromes

Other potential users
- Aviation authorities
- Airliners (Flight planning teams, pilots)
- UAS operators

Satellite Space Weather services
Service Chain
User Products

Operational Status monitoring

Real Time GNSS discontinuities alerts
Forecast potential discontinuities

GNSS Performance assessment

Performance (Accuracy / Integrity)

Support post-incident / accident investigations

GNSS Data recording

Performance (Availability)
Market Trends

• Many of Europe’s small and regional airports cannot afford the high costs of installing and maintaining ground-based Instrument Landing Systems (ILS)
  • Others are planning to discontinue ILS due to budget constraints

• Many common new aircraft coming onto the market are SBAS ready
  • We are also seeing more and more retrofit solutions that allow legacy aircraft to add SBAS capabilities

• 40 EGNOS agreements are signed between ESSP and Aviation entities, including 12 in 2015 and another 10 planned for 2016, tripling the number over the last 2 years

• Airports with Localiser Performance with Vertical guidance (LPV) procedures continues to increase (340 LPV by 2016)

• UAS growth with high GNSS dependency

• The space weather commercial sector is more developed in US, although we can find some European commercial companies
  • Current focus is more on the scientific field
Conclusions and Next steps

• **Conclusions:**
  • SBAS approaches are becoming operational at European airports after its wide application at US airports
  • High awareness of Aviation stakeholders to Space Weather impact
    • Although there are not yet commercial solutions addressing the problem
  • Air Navigation Service Providers (ANSPs) are interested in GNSS local monitoring and also in specialized Space Weather services
  • To Market a product in the Aviation sector, regulatory issues are key, in particular regarding certification procedures
  • 1st Customer concept is important
    • Adoption by the end-users is not straightforward

• **Next steps:**
  • Setup a Demonstrator project, preferably under the ARTES 20 program (IAP)