GALILEO
HIGH ACCURACY SERVICE DAYS
HAS FOR AGRICULTURE AND MACHINE CONTROL

Hemisphere GNSS
HAS Topics

1. General
2. Machine Control
3. Agriculture
4. Future
HAS Performance Potential

- Service Level 1 (SL1)
  Target, 2023:
  - 10 cm RMS (H)
  - 20 cm RMS (V)
  - 300 seconds resolve
  - 99% availability
  - Global coverage

- Service Level 2 (SL2)
  Target, Future:
  - Improve to 100 sec. within Europe
Concerns For Use In The Machine Control Market

• Most applications:
  • 0.5 to 2.0 cm RMS (V)
  • Obstructed sky
    • 5 sec resolve time
• Some applications:
  • 10-30 cm Horizontal
  • No vertical requirement
  • Open sky
HAS in general

How Are HAS Corrections Different Than Other Satellite-Based Corrections

- SBAS, typical PPP:
  - Use 1-3 geostationary satellites
  - Environmental blockages occur
How Are HAS Corrections Different Than Other Satellite-Based Corrections

- HAS corrections
  - Transmit on MANY satellites
  - Improves reception likelihood
HAS in general

Hemisphere and HAS
- Phantom and Vega platforms include E6BC signal capability
- Beta released in February 2023
- Full release in July 2023 with firmware version 6.1.1
1. HAS in general

Correction Structure
- Identical correction fragments
  - Received from several satellites simultaneously
  - One fragment “wins”, others are “redundant”
1. HAS in general

Corrections Received Over 24 Hours, By Galileo Satellite Number
HAS in general

A Good Time For Corrections
HAS in general

A Tough Time For Corrections
HAS in general

Missing Corrections

- green: redundant
- orange: dummy
- blue: used
- red: dropped

#EUSpace
The Past

“Some people name machine control systems the biggest change in road-, earth- and civil construction since the industrial revolution. They talk about a technology boom, which will change the way of project planning, the construction companies, the building worker, the way of grading and digging for ever. All that was done manually in the past, today can be executed more efficient and accurate by using machine control.”

Caterpillar Productivity Study, Malaga 2006
2.

HAS for Machine Guidance

The Present

HAS Machine Control Applications
• Constraints and limits:
  • Only horizontal positioning
  • Open sky conditions
• Opportunities:
  • Asphalt compaction
  • Soil compaction
  • Landfill compaction
  • Any application where monitoring and logging position within HAS threshold is sufficient

Courtesy of BOMAG GmbH
HAS for Machine Guidance

Asphalt Compaction

“It’s all about data and their position on the maps....”

- Pass count
- Temperature
- Compaction data (vibration)
- Improved up time in urban canyons and difficult environment
- *Go Green* – Reduced CO2 emissions by less passes
HAS for Machine Guidance

Courtesy of BOMAG GmbH
Galileo HAS helping people in agriculture

The biggest portion of agriculture applications requires no vertical position accuracy but only 30 cm pass to pass accuracy in horizontal x and y. Good examples for these applications would be spraying with section control included and grass cutting guidance only to name two. The required multi Frequency activation on receivers as an addition even improves performance. Investment for the farmer is similar to Hemisphere’s Atlas Basic lifetime PPP activation, but would drastically increase numbers of tracked satellites and therefore uptime and reliability of signal of the receiver used in the guidance or steering application.
Spraying with section control

- Investment for farmer identical to Atlas Basic PPP Service
- Increased satellite count
- Less taxing on navigation computer
- Reduced risk for blockages
- Improved performance in difficult environment
HAS in Agriculture

HAS Advantages in Construction & Agriculture

- Global availability
- Simplicity
- No radio licensing and local frequency requirements
- No radio / cellular / WiFi coverage issues
- Reduced cabling, simple installation
- Fewer points of failure and less blockages
HAS & Future Applications

THE FUTURE.....?

Challenges and opportunities for Robot and Autonomous Driving for NRMM

• New Machinery Directive in 2027
• Setup with PL D or SIL 2
• Cybersecurity
• More autonomous operations will replace traditional working based on reduced availability of skilled workers

Courtesy of AgroIntelli ApS
¡THANK YOU!