



Shipborne AIS / GNSS

Premium AIS transponders and precision navigation systems



AIS/VDES Base Stations

Premium AIS base stations for coastal and offshore marine traffic monitoring



Airborne AIS and ADS-B RX

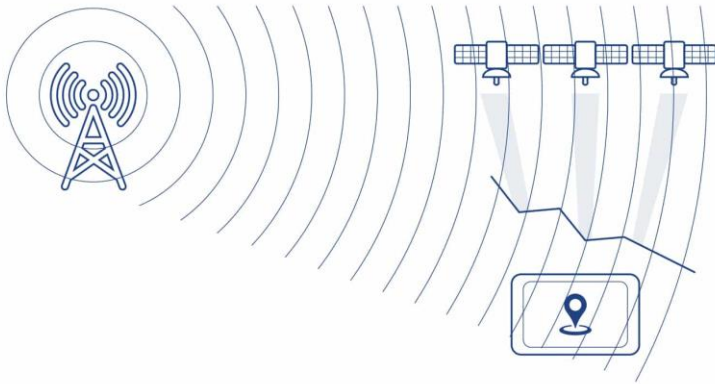
Premium Airborne AIS transponders for marine traffic monitoring



GNSS jamming and spoofing

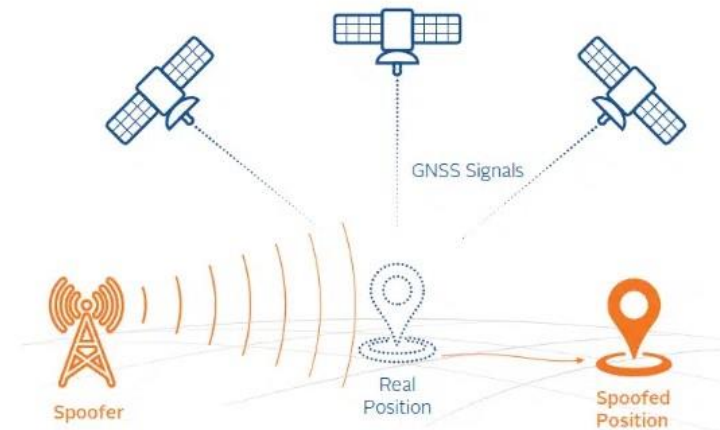
Jamming/blocking

- Transmitter creates noise which prevents GNSS receivers from locking to authentic GNSS satellites
- Simple equipment and low cost
- Jamming can be intentional or unintentional from internal/external transmitters

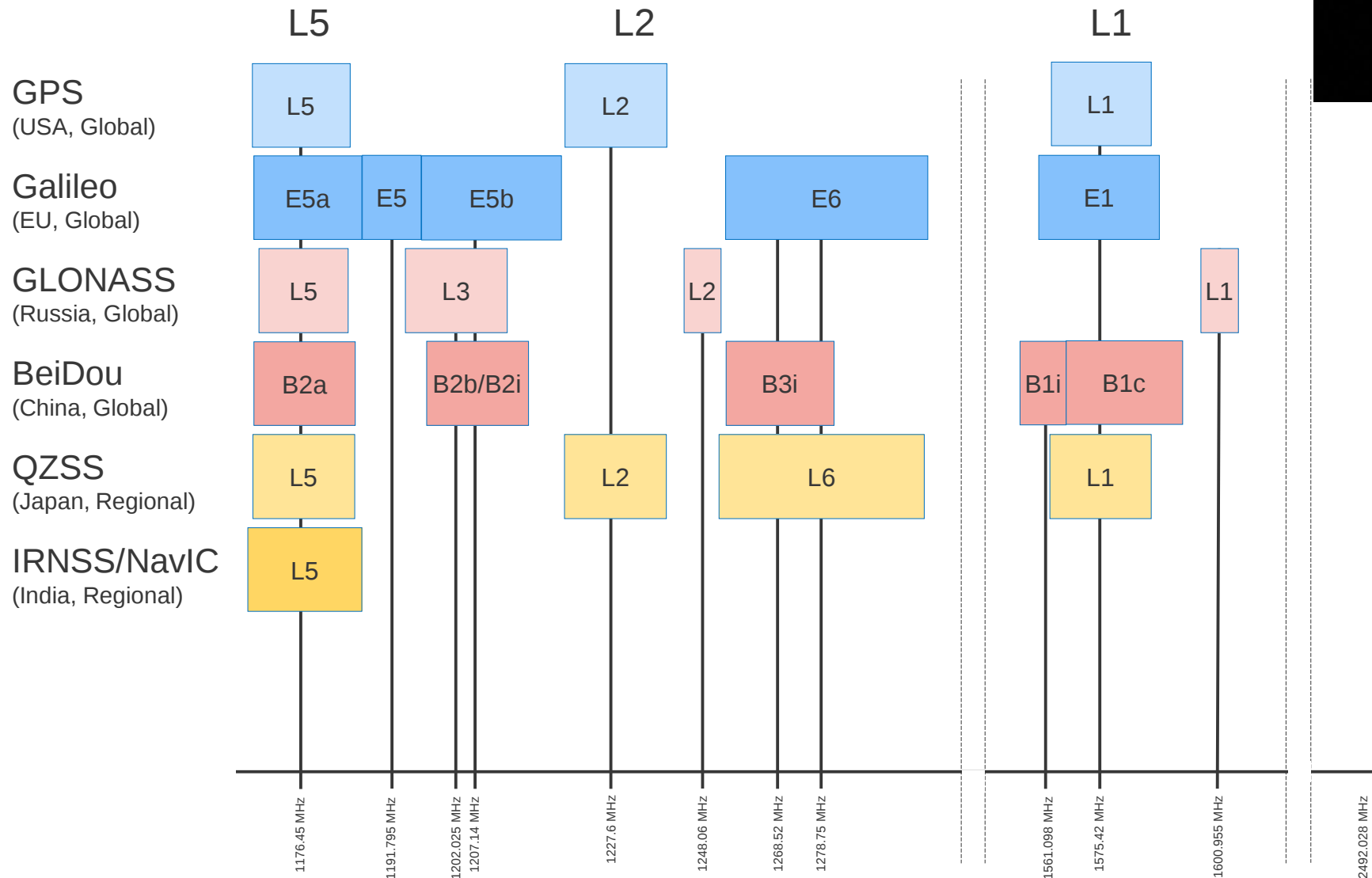


Spoofing

- A fake signal overpowers real GNSS signal to provide a false position
- More sophisticated attacks
- More dangerous, harder to detect



GNSS Spectrum



Using multiple frequency bands allows the receiver to correct for atmospheric signal delays, improving accuracy and reliability.

Multi-frequency reception further boosts GNSS performance by unlocking access to correction services such as the global Galileo HAS or a local RTK service.

R6 NAV Systems



R6 NAV GNSS/DGNSS

7001 000-730, 7001 000-731

Ideal for standard maritime operations

- Multi-GNSS
- SBAS
- IALA Beacon
- 800 channels

R6 NAV PRO RTK

7001 000-733

Multi-frequency DGNSS for enhanced accuracy.

Robust resilience against jamming and spoofing.

- Multi-GNSS, Multi-Frequency
- SBAS
- IALA Beacon
- Galileo HAS
- Atlas L band
- RTK
- 800 channels



R6 NAV PRO Compass

7001 000-752, 7001 000-753

Powerful DGNSS Compass with IMU option for enhanced motion monitoring and THD.

Robust resilience against jamming and spoofing.

- All features from R6 NAV PRO RTK
- Spoofing detection
- 1,100 channels

R6 NAV NEO

7001 000-751

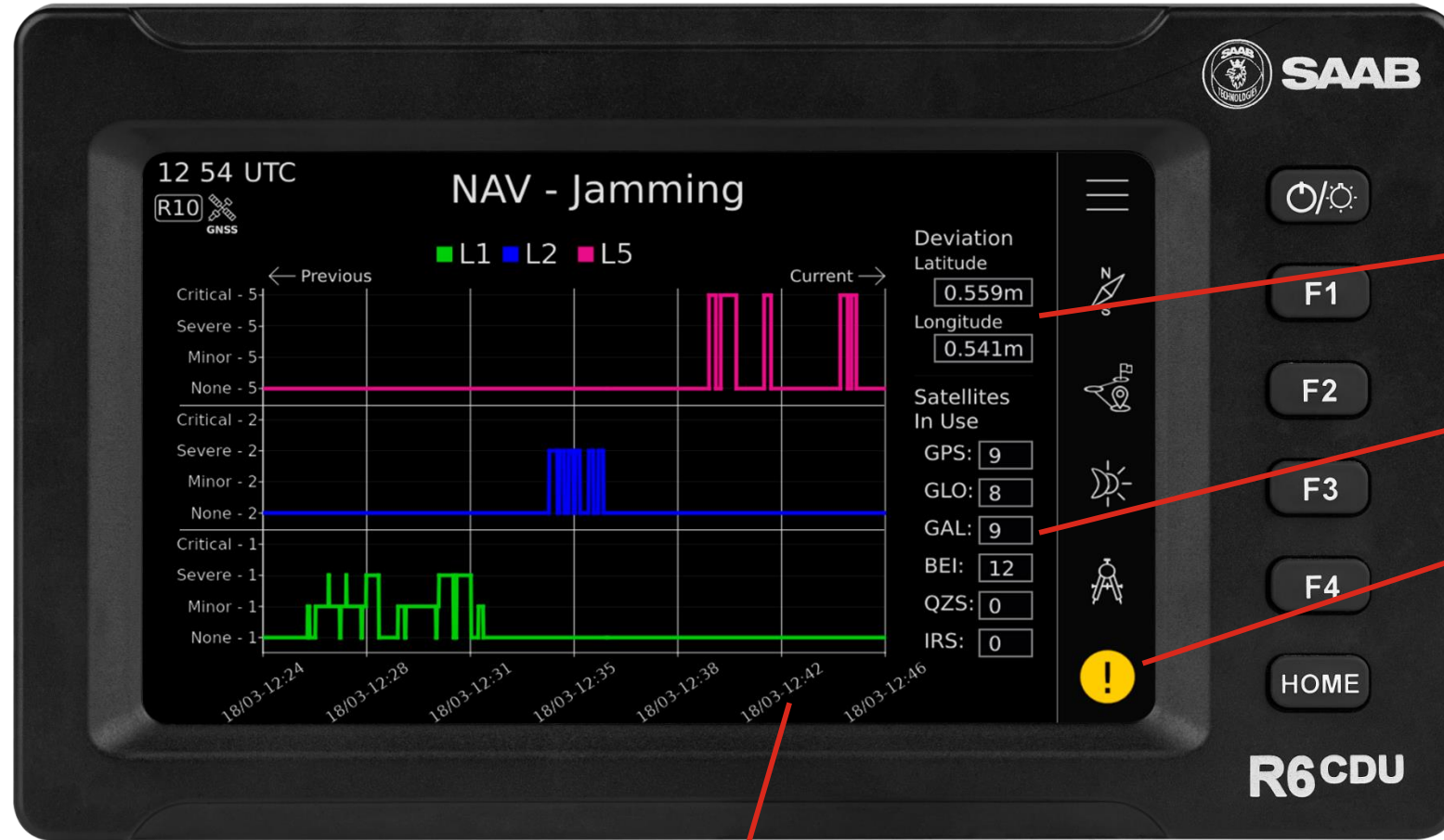


Powerful DGNSS Compass and Panama approved NPPU

- All features from R6 NAV PRO Compass+
- Approved by the Panama Canal Authorities as Non-Portable Piloting Unit, NPPU.
- It's 2 in 1, ideal for NeoPanamax



Multi-band jamming detection



Jamming monitoring separately across L1, L2, L5.

Detection in four levels: None, Minor, Severe, Critical.

Error in current position solution

Satellites in use

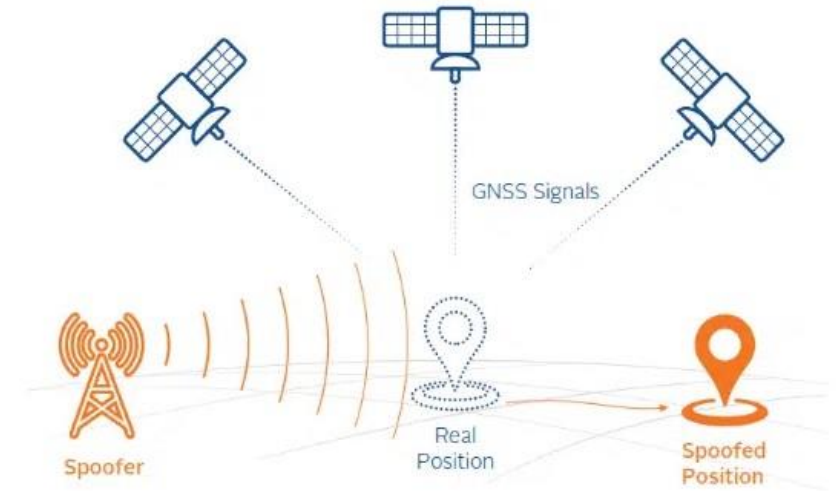
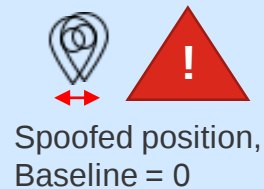
BAM compliant alerts

Time stamps and possible to save log

Spoofing detection, R6 NAV PRO Compass



By monitoring the precise antenna baseline, a “successful” spoofing event will generate a deviation from the expected baseline and an alert when a false signal tries to give both antennas a false identical position.



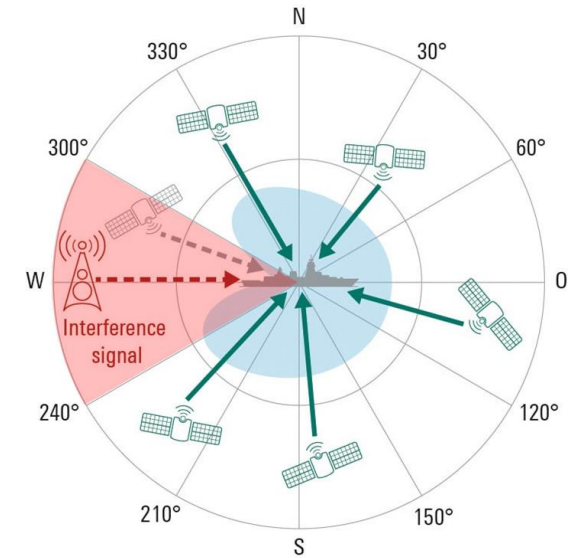
Resilience to jamming is a first step to protect from spoofing, with spoofing detection as an extra layer of protection. Spoofing attacks often start with a jamming phase, forcing receivers into reacquisition mode, then inject synthetic or rebroadcast (meaconed) signals.

Future trends in PNT

Resilience (recover quickly):

- Advanced GNSS jamming/spoofing protection
- Galileo PRS, GPS M-code
- Anti-jamming antennas
- IMU MEMS aiding
- Other aidings (depending on vessel)
- VDES R-Mode (terrestrial, maybe also from LEO satellites)

Helical or CRPA under evaluation:



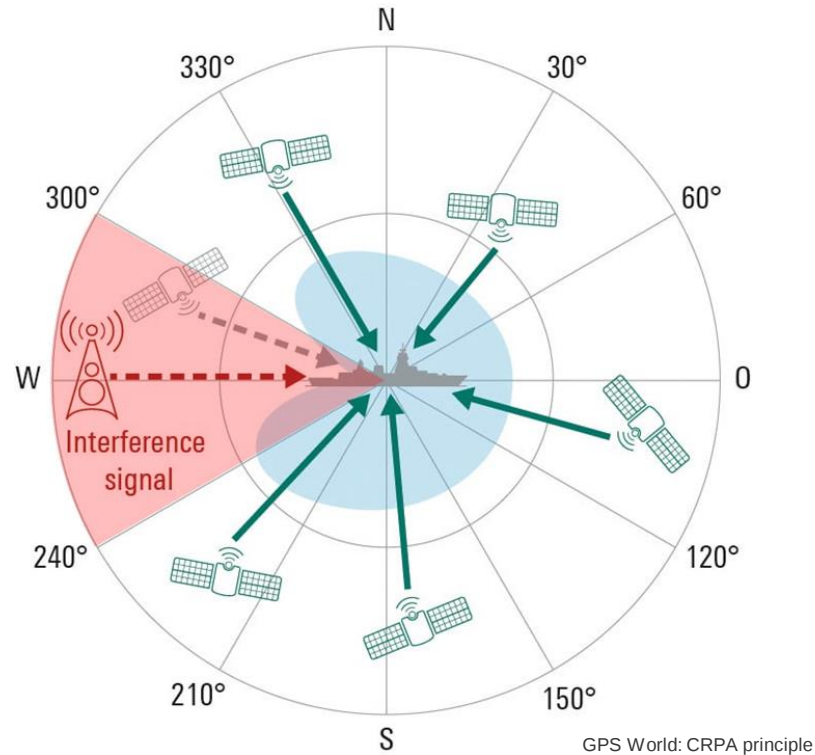
GNSS positioning, navigation, and timing (PNT) is necessary for the functioning of many critical infrastructure sectors.

However, GNSS space-based signals are low-power making them susceptible to both intentional and unintentional disruption.

Augmentation system may also be a part of PNT definition.

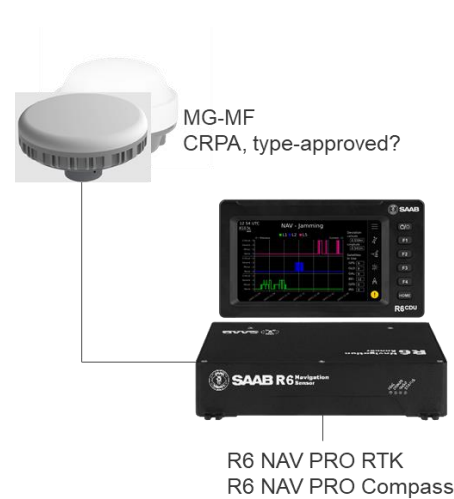
Position indication system may also be a part of PNT definition.

CRPA under evaluation

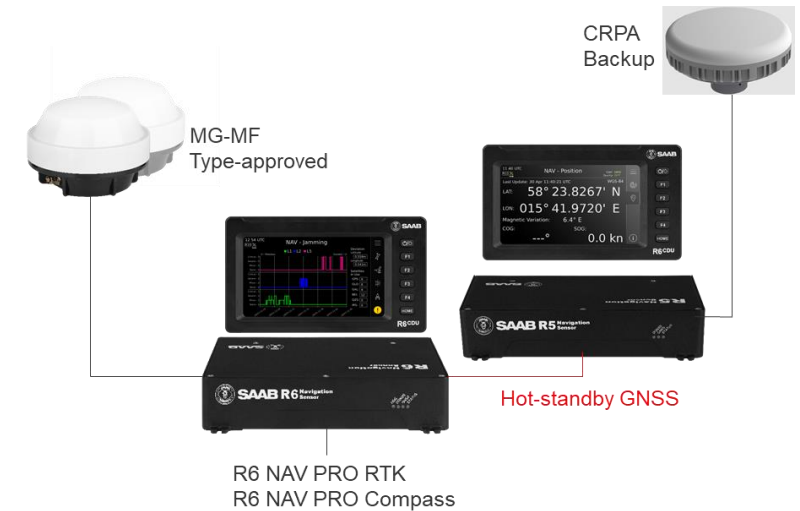


Controlled reception pattern antenna (CRPA)

- Multiple active antenna elements
- Can shut down a sector, angle of interference arrival
- Limited but continued signal reception



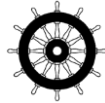
A. CRPA optional for main GNSS



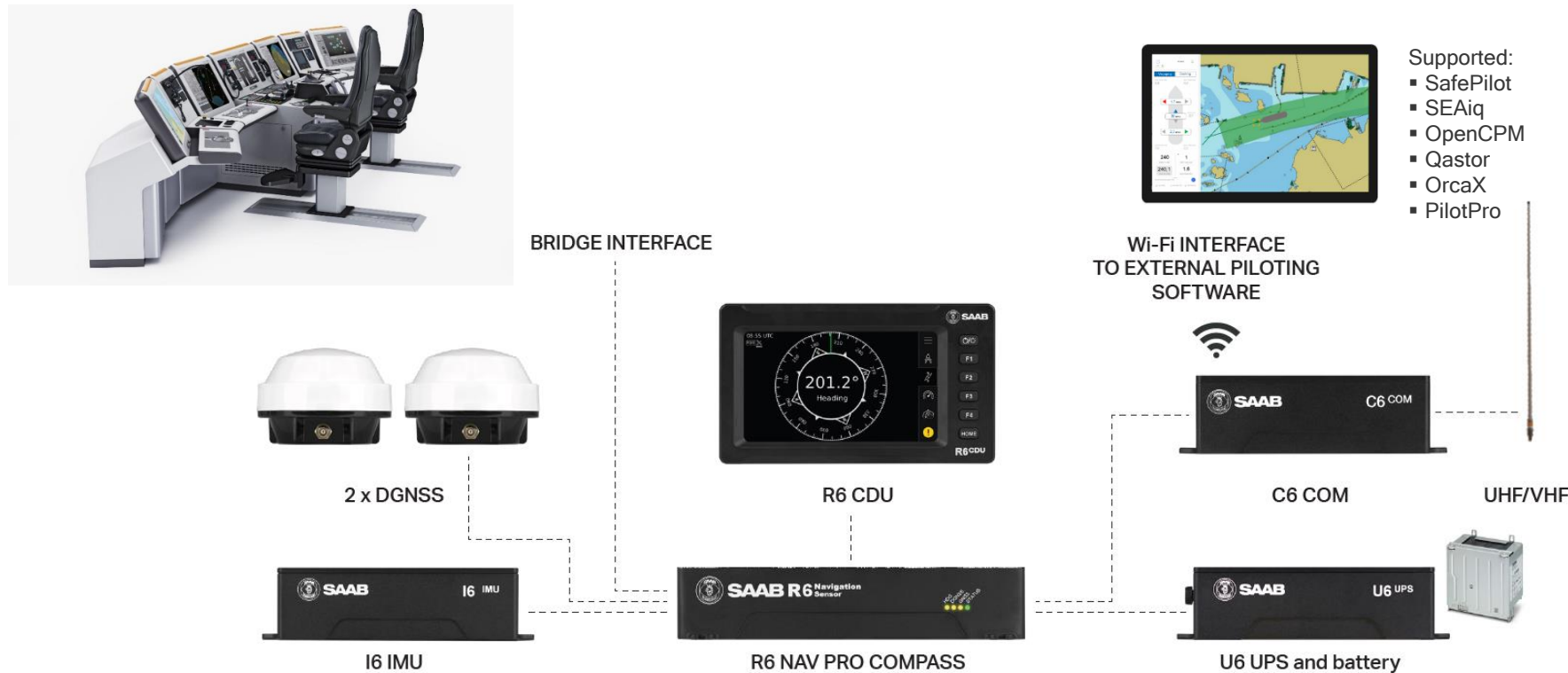
B. CRPA on backup hot-standby GNSS

R6 NAV NEO, fully integrated

IMO type-approved precision navigation
(R6 NAV PRO Compass+)



Panama approved NPPU
(With C6 COM and U6 UPS added)



The Panama approved **R6 NAV NEO** is built on the type-approved R6 NAV PRO Compass for maximum global usability.



Jammertest 2025, Andöya



Car tests at Andöya



Equipment bay

Stena Horizon travels Travemünde – Liepāja

using R6 NAV anti-jamming anti-spoofing technology



Anti-jamming and anti-spoofing of R6 NAV technology tested in Finland (NLS) and live at Jammertest 2025 in Norway/Andöya.

NLS: National Land Survey of Finland

Jammertest 2025: <https://jammertest.no/jammertest-2025/>



Thank You !



Andöya with jammer/spoofer in background
hilly area