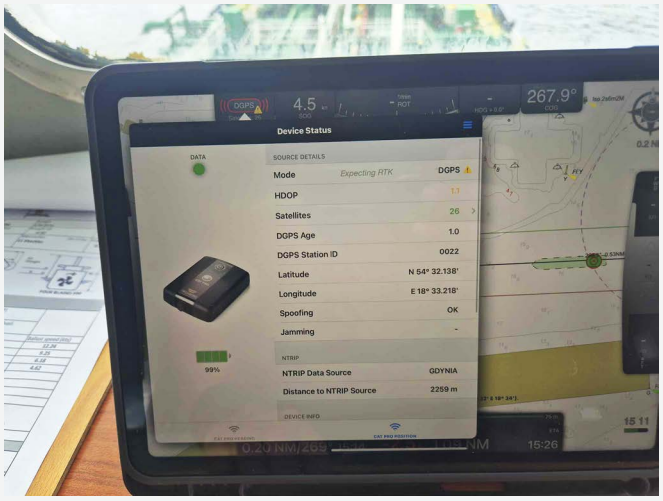
Enhancing navigational precision with SafePilot

PORT OF GDYNIA CASE STUDY

The Port of Gdynia in Poland is a critical Baltic gateway with challenging conditions for large vessel operations, particularly due to its tight confines. Its main turning basin measures 440 meters in diameter, serving vessels up to 366 meters in length. This configuration results in a safety factor of 1.2 between basin and vessel size, recognized as a tight operational environment with a very small margin for error. Future expansion plans for a 480-meter basin to accommodate 400-meter vessels will maintain similarly tight operational parameters. Pilots at Gydnia must therefore ensure precision in all berthing, turning, and unberthing maneuvers, a task compounded by the port's exposure to sophisticated GNSS interference. Recognizing the need for enhanced positioning, the Port Authority had established a Real-Time Kinematic (RTK) reference station approximately eight years prior, laying the groundwork for an advanced technological solution.

CHALLENGE

The principal challenge for Gdynia's pilots was achieving the required navigational precision within the constrained turning basin relative to vessel size. Traditional navigation systems were inadequate for operations demanding utmost accuracy, where any miscalculation could lead to significant safety or environmental incidents. This geometric constraint was severely compounded by the increasing frequency and sophistication of GNSS jamming and spoofing attacks. These electronic threats could render a ship's conventional equipment unreliable or inoperative, leaving pilots without critical positioning data precisely when it was most needed. The combination of tight physical margins and unreliable navigation aids created a complex matrix of safety requirements and substantial economic risks, including operational delays and potential damage to vessels and port infrastructure.



SOLUTION

Trelleborg's SafePilot PPU CAT PRO system was implemented to deliver the necessary positioning accuracy and operational reliability. Deployed with two primary units and a Wi-Fi extender, the system leverages the port's existing RTK reference station to provide real-time corrections and achieve a positioning accuracy of up to 1 centimeter. This implementation provided pilots with a stream of critical, real-time information, including minimum safe speeds during turning maneuvers, predictive data for narrow channel transit, precise lateral speed measurements for berthing, and Rate of Turn (ROT) calculations for optimal control.

One of the key strengths of the SafePilot system is its reduced vulnerability to jamming and spoofing attacks. By tracking multiple satellites simultaneously across four global constellations (GPS, Galileo, BeiDou, and GLONASS) and utilizing multiple frequencies for each constellation, the system ensures a higher level of resilience. Additionally, all SafePilot PPUs are equipped to detect potential spoofing or jamming attempts and actively provide warnings through the SafePilot navigation software. This capability allows the system to maintain reliable positioning data in most scenarios, seamlessly integrating into existing pilot procedures and enhancing safety without disrupting workflows.

OUTCOME

The implementation has delivered measurable improvements in operational safety and efficiency. It has allowed the port to maintain capability during GNSS attacks, enhance maneuvering precision in a challenging environment, and reduce operational risks across all weather conditions. This has improved pilot confidence and positioned the port to safely accommodate future larger vessel traffic.

Tomasz Dobrzyński, Deputy Chief Pilot, Gdynia Pilot Station Gdynia using SafePilot Pro on an iPad with CAT PRO PPU.

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