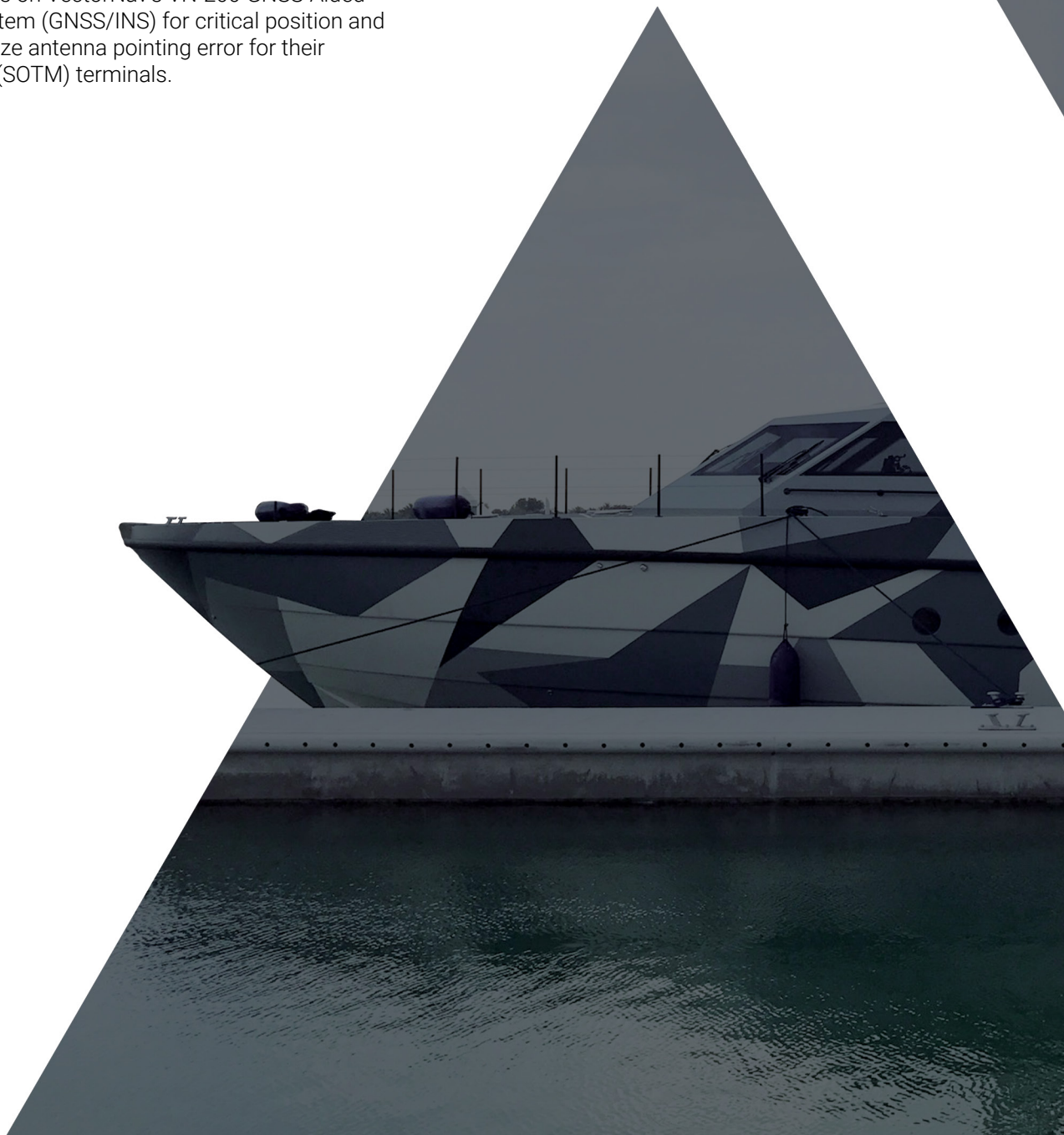
VECTORNAV

CASE STUDY

HIGH PRECISION ANTENNA POINTING

VN-200 GNSS-Aided Inertial Navigation System for Satcom On the Move

Skytech Research relies on VectorNav's VN-200 GNSS-Aided Inertial Navigation System (GNSS/INS) for critical position and attitude data to minimize antenna pointing error for their Satcom On The Move (SOTM) terminals.



Introduction

Uptime and bandwidth are the critical performance metrics for Satcom On The Move (SOTM) systems and relate to the ability of the system to efficiently transmit and receive large amounts of data. To ensure a high percentage of uptime, it is necessary that the SOTM terminal is pointed directly at the target satellite. To maximize bandwidth, the antenna pointing error must be less than +/-0.2 degrees in order to maximize transmission power and remain within regulatory requirements as stated in the FCC Vehicle-Mounted Earth Station (VMES) rules. Maintaining accurate pointing for SOTM terminals is a significant challenge due to the need to measure and compensate for a wide range of platform dynamics, such as those experienced by land, marine, or aerial vehicles.

Skytech Research required a small, durable, and reliable inertial navigation system that could be integrated into their full range of terminals in order to provide precise positioning and attitude data under all operating conditions.

Challenge

To address the challenge of maintaining accurate pointing performance, Skytech implemented a closed-loop control system, which uses signal strength measurement as feedback. As the satellite moves across the sky, a conventional parabolic antenna scans the signal strength and tracks its maximum value. This technique requires deliberately introducing a pointing-error (constant variation) to ensure that the signal maximum has indeed been located.

The SOTM terminal controller also requires additional information to compensate for platform motion in order to remain locked around the center of the signal. An inertial navigation system (INS) mounted on the platform can provide high accuracy, low latency measurements of the platform position, attitude (pitch, roll and yaw), and angular rates in order to provide pointing corrections to the SOTM terminal controller. Skytech's compact, light, and self-contained high-performance VSAT equipment required an INS that could be integrated into the full range of terminals from 30 cm to 150 cm diameter antenna and could fit on the smallest terminal pedestal and within the radome. The INS needed to provide precise positioning to enable fast acquisition and tracking of the target satellite and accurate pitch and roll to within 0.5° in both static and dynamic situations. Most importantly, Skytech required an INS that would be reliable and consistently perform to specification in the trying conditions the terminals are subjected to.

SkyTech
an IDS Ingegneria Dei Sistemi company

COMPANY PROFILE

Skytech Research Ltd. designs and manufactures a wide range of multi-band Ku/Ka and X/Ku/Ka stabilized satellite communication terminals for professional and recreational maritime use, upmarket mobile land vehicles, and for military and law enforcement. Skytech Research Ltd. is a part of IDS Ingegneria Dei Sistemi.

APPLICATION
Satcom On The Move

VECTORNAV PRODUCT
VN-200 GNSS-Aided
Inertial Navigation System

SKYTECH RESEARCH PRODUCT
BB50 Ka-Band Antenna

How VectorNav Helped

Skytech evaluated several suppliers of inertial measurement units, but only VectorNav satisfied their needs in terms of product performance, price, and support. "When selecting a navigation solution provider, there are many criteria that one needs to evaluate, but there are two that are most important to us. The first is obvious: the product needs to perform reliably and according to specification. Secondly, the provider needs to stand behind their product with capable support personnel that are ready to help at any moment and make us feel like valuable customers. VectorNav is the only company that has consistently provided both," said Federico Zarghetta, CEO of Skytech Research.

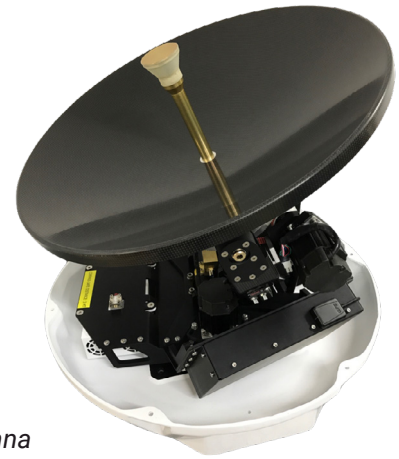
Close collaboration between Skytech and VectorNav resulted in the decision to use the VN-200 GNSS/INS to provide position and attitude feedback to the terminal controller. The VN-200 was easily integrated with Skytech's terminals because of its small size, low power requirements, and simple interface. Skytech mounted the VN-200 directly onto the terminal frame under the radome, keeping the entire system enclosed and compact. The high accuracy and low latency of the VN-200 enables Skytech to deliver terminals that are incredibly light, compact, and unsurpassed in satellite tracking in harsh environments characterized by high levels of shock, vibration, and oscillation.

VN-200 GNSS-AIDED INS

VN-200 Rugged

Results, Return on Investment and Future Plans

VectorNav's reliable products and consistent customer support provided an optimal solution to Skytech's challenges. Skytech and VectorNav have established a successful partnership that will continue to deliver market-leading products and adapt to evolving needs in the field. "VectorNav helped us in our moment of need and have continued to support us as we bring new products to market. We are extremely glad to be able to partner with them," said Zarghetta.



Skytech Research's BB50 Ka-Band Antenna

KEY SPECIFICATIONS

NAVIGATION & IMU

Heading (INS)[1]	0.2°, 1σ
Pitch/Roll (INS)[1]	0.03°, 1σ
Gyro In-Run Bias Stability	5-7 °/hr typical
Max IMU Data Output Rate	800 Hz

PHYSICAL & ELECTRICAL

Dimensions	36 x 33 x 9.5 mm
Weight (SMD)	16 g
Max Power Consumption	500 mW

1. With sufficient motion for dynamic alignment.

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About

VectorNav Technologies is a leading developer and manufacturer of high performance inertial navigation systems using the latest inertial sensor and GPS/GNSS technology. Since its founding in 2008, VectorNav has provided systems integrators in the Military, Aerospace, Marine, and Robotics industries with inertial navigation solutions with best-in-class price to performance ratios.

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