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ORBIS MARITIME KINEMATICS

PRECISION DATA FOR CONFIDENCE AT SEA

THE PROBLEM

Many of the most critical challenges in maritime science and naval architecture depend on accurately knowing the sea state, water level, vessel position and motion, and even structural distortions such as twisting and warping, but obtaining these measurements in the real world is notoriously difficult. The ocean is a dynamic, chaotic environment filled with waves, wind, spray, and constantly shifting forces, while vessels themselves are large, flexible, and difficult to instrument with precision. Traditional measurement methods simply weren't designed for this complexity; many are too coarse, too slow, or too unreliable to support today's safety, performance, and operational demands. As a result, the industry still often relies on outdated tools - pendulums, float gauges, rough visual estimates, and even gut feel - when making decisions that truly require high-quality, real-time insight.

AT DOCK

Naval architects and ship builders perform incline testing to measure and validate stability calculations

AT SEA

Buoys and coastal stations continuously measure sea state, tides, and sea level trends.

UNDERWAY

Vessel dynamics and en route trim measurement are critical for optimizing fuel efficiency and reducing parametric instability.

OUR SOLUTION

MARITIME KINEMATIC (MK) RADAR

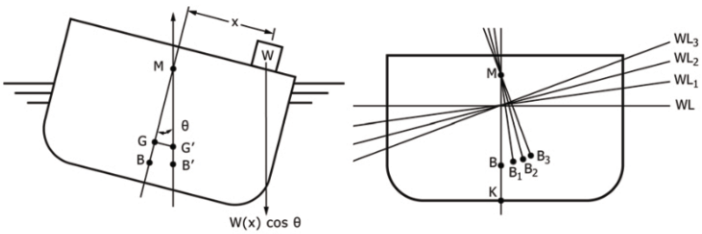
MK RADAR provides high-precision measurements of a vessel's freeboard, even in challenging maritime conditions such as spray, fog, and rough seas. Using advanced signal processing, the radar accurately detects the water surface relative to the deck, enabling real-time monitoring of vessel draft. Beyond freeboard measurement, the system is equally effective for incline testing, stability assessments, and environmental monitoring, including tide and sea-state analysis. By delivering reliable, continuous data where traditional gauges fail, MK RADAR ensures operators, naval architects, and researchers have the actionable insight needed for safety, performance optimization, and decision-making in dynamic maritime environments.

MARITIME KINEMATIC (MK) FUSION

MK FUSION uses a distributed network of synchronized sensor nodes - each combining high-precision GPS, IMU, and optional radar inputs - to capture motion and environmental data from multiple points across a vessel. By fusing these measurements with advanced filtering and modeling techniques, MK FUSION reconstructs the vessel's full 6-DOF motion, structural dynamics, and even localized deformation such as twisting or flexing. This multi-point approach allows the system to back-calculate true vessel behavior with exceptional accuracy, overcoming the limitations of single-sensor measurements and revealing a complete, real-time picture of how the vessel interacts with the sea.

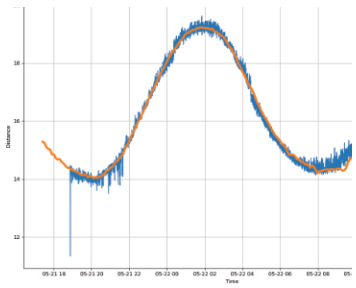
INCLINE TESTING

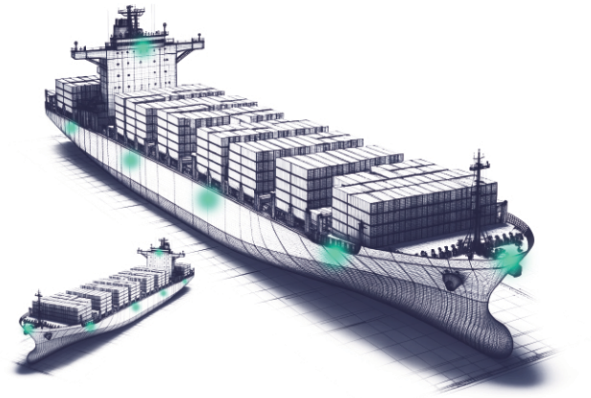
MK RADAR can be deployed as a handheld freeboard measurement tool in combination with a single MK FUSION sensor node, offering a modern replacement for traditional pendulums used in incline testing. This approach allows technicians to quickly and safely assess vessel list and trim without the cumbersome setup and risk of manual measurements. By leveraging precise radar distance measurements and inertial data from the sensor node, the system dramatically reduces errors caused by wind, waves, or operator variability, delivering faster, safer, and more accurate results than conventional methods.



SEA LEVEL MONITORING

MK RADAR mounted on a fixed station enables continuous, real-time monitoring of sea level changes, tides, and overall sea state, providing critical environmental data with high temporal and spatial resolution. Beyond simple water level measurements, the system can infer wave direction, swell height, and the effects of wind and currents, offering a detailed picture of local hydrodynamics. Its compact, modular design allows for rapid deployment in dense networks along rivers, marshes, inlets, and coastal regions, making it an ideal tool for environmental monitoring, flood assessment, and research applications where distributed, high-accuracy measurements are essential.





VESSEL DYNAMICS

MK FUSION sensors can be deployed along a vessel's structure to continuously measure trim, heel, and motion while underway, providing real-time insight into how the ship interacts with waves, cargo load, and fuel distribution. By analyzing this data, operators can optimize vessel trim to improve hydrodynamic efficiency, reduce fuel consumption, and maintain stability within safe operational limits. This continuous monitoring allows for proactive adjustments, minimizing the risk of unsafe inclines or excessive roll, while enhancing overall operational performance and cost-effectiveness.

ABOUT

ORBIS is a veteran-owned small business (VOSB) established in 2000 that provides engineering, technical, and consulting services to the Department of Defense (DoD) and Commercial Clients. Our employee demographics include engineers, scientists, researchers, and technicians, often prior military personnel representing all branches of the Armed Forces.

CAPABILITIES

- Electrical, Mechanical and Software Engineering
- Circuit Card Assembly (CCA) Design
- Embedded System Design, FPGA Programming
- Reverse Engineering Services
- AI Solutions
- Automated Test, Data Acquisition and Control
- LabVIEW Software Expertise, Certified Developers
- CAD and SolidWorks Modeling, Simulation
- Prototyping through Production Capabilities
- ISO 9001:2015 Certified
- Appraised at CMMI L3 for Development

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