

## UNIQUE SOLUTIONS



## FOR UNMANNED PLATFORMS

EN V1.2

[www.imar-navigation.de](http://www.imar-navigation.de)



**iMAR's strengths and expertises comprise the fast and reliable realisation of out-of-the-box concepts, the development of complete, customer-specific system solutions for autonomous vehicles as well as test environments for the verification or homologation of autonomous systems.**

**FOR A WORLD  
IN MOTION**

**DEFINE STANDARDS ANEW**

**iMAR is a worldwide leading  
developer and producer of  
inertial sensor, satellite and  
machine vision based solutions  
for Navigation, Guidance, Control,  
Surveying and Stabilisation.**

# iMAR Solutions for



## UNMANNED LAND PLATFORMS

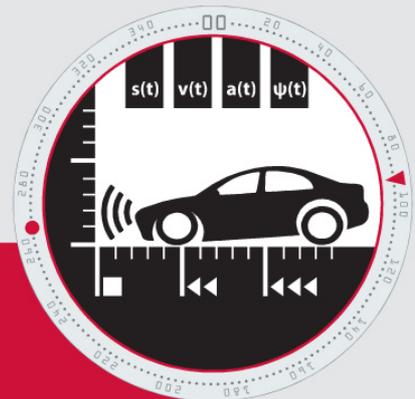


### AUTONOMOUS PARKING & SHUNTING

iMAR develops intelligent solutions for outdoor and indoor applications: for example, for the fully automatic driving off the production line and the autonomous allocating of a free parking space.

### VERIFICATION OF SENSORS & ACTUATORS

Timely and reliable accelerating and braking are essential and vital. iMAR develops solutions using its technology of fully autonomous guidance and control of vehicles, which guarantees a verification of safety critical components in and for dynamic test environments.



### TURN-KEY TEST AND PROVING GROUND AUTOMATION

From vehicle equipment for positioning, control and communication up to the complete proving ground infrastructure: iMAR signifies pathbreaking developments of system components up to complete solutions, e.g. acc. to ISO 22133.

**TREND SETTING • COMPLETE**

# iMAR Solutions for

## UNMANNED LAND PLATFORMS



### COMMAND AND GUIDANCE OF UNITS (MIL)

For the sake of your mission:  
Rely on the high end solutions of iMAR for the determination and visualisation of your own position and heading, for target determination and allocation.

- Command and control of units (platoon, company, battalion, ...)
- Battle Field Management
- Swarm Control



### UNMANNED PLATFORMS — INDOOR & OUTDOOR

Extremely efficient, cost saving, constantly ready for use.  
UGVs (unmanned ground vehicles) conquer the mining industry, road construction industry and the exploitation: supported by inertial, GNSS, visual and many other technologies of iMAR.

### QUALITY ASSURANCE & CONTROL

- Material structure surveillance and control
- Load tests, e.g. for personnel protection in leisure parks
- Surveillance of buildings and structures
- Indoor – Positioning & Guidance of personnel etc.

Smart solutions from iMAR provide highest reliability.



## SOLUTIONS • EASY OPERATION

# iMAR Solutions for



## UNMANNED AIR PLATFORMS



### UNMANNED AERIAL VEHICLES (MIL)

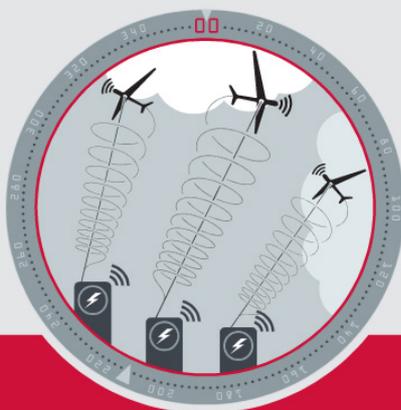
- Navigation – Surveillance – Reconnaissance
- Airborne Gravimetry
- A /C Guidance
- Target Displays / Drones

Precision, compactness as well as EMI /EMC and environmental hardening distinguish iMAR's solutions from others, also for UAV applications.

### COMMAND AND CONTROL OF AIRBORNE FORCES / SQUADRONS

- Acrobatic flights
- mixed swarms (manned / unmanned)
- Airborne refuelling

Civil or military, cost and safety aspects require the operation of fully automated or mixed manned and unmanned vehicles in swarms – with iMAR's family of iNAT navigation system, in combination with the iDMN Dynamic Mesh Communication Network, iMAR provides a leading answer and solution also for this requirement.



### SPECIAL APPLICATIONS

- Automated free house deliveries of goods by unmanned vehicles
- Automated vehicle guidance, e.g. for energy harvesting with kites

The future has started, secure it and be part of it. iMAR provides the required system components and the total solutions – also available as an air – land – sea network.

**TREND SETTING • COMPLETE**

# iMAR Solutions for

## UNMANNED SEA PLATFORMS



### AUTONOMOUS UUV

Localisation and control of autonomous underwater vehicles (AUV) and remote operated vehicles (ROV)

- Guidance of underwater vehicles, among others for exploration, wreck searching etc.
- Reconnaissance, mine hunting etc.
- Torpedo navigation



### AUTONOMOUS SURFACE VESSELS

- Command and control of a convoy
- Dynamic Positioning / berthing
- Simplifying the landing of UAVs on ships
- Improvement of comfort and safety on vessels

iMAR's systems allow all this, due to the optimised hardware and software (INS / GNSS / VISION sensor fusion), control of rudder & flaps, a secure communication network (Mesh) etc.

### AUTONOMY AT SEA, ON BORD & IN THE HARBOUR

- Automation of harbour tugs
- automated loading and de-loading of vessels
- Logistics, fleet management and control of straddle carriers in container harbours

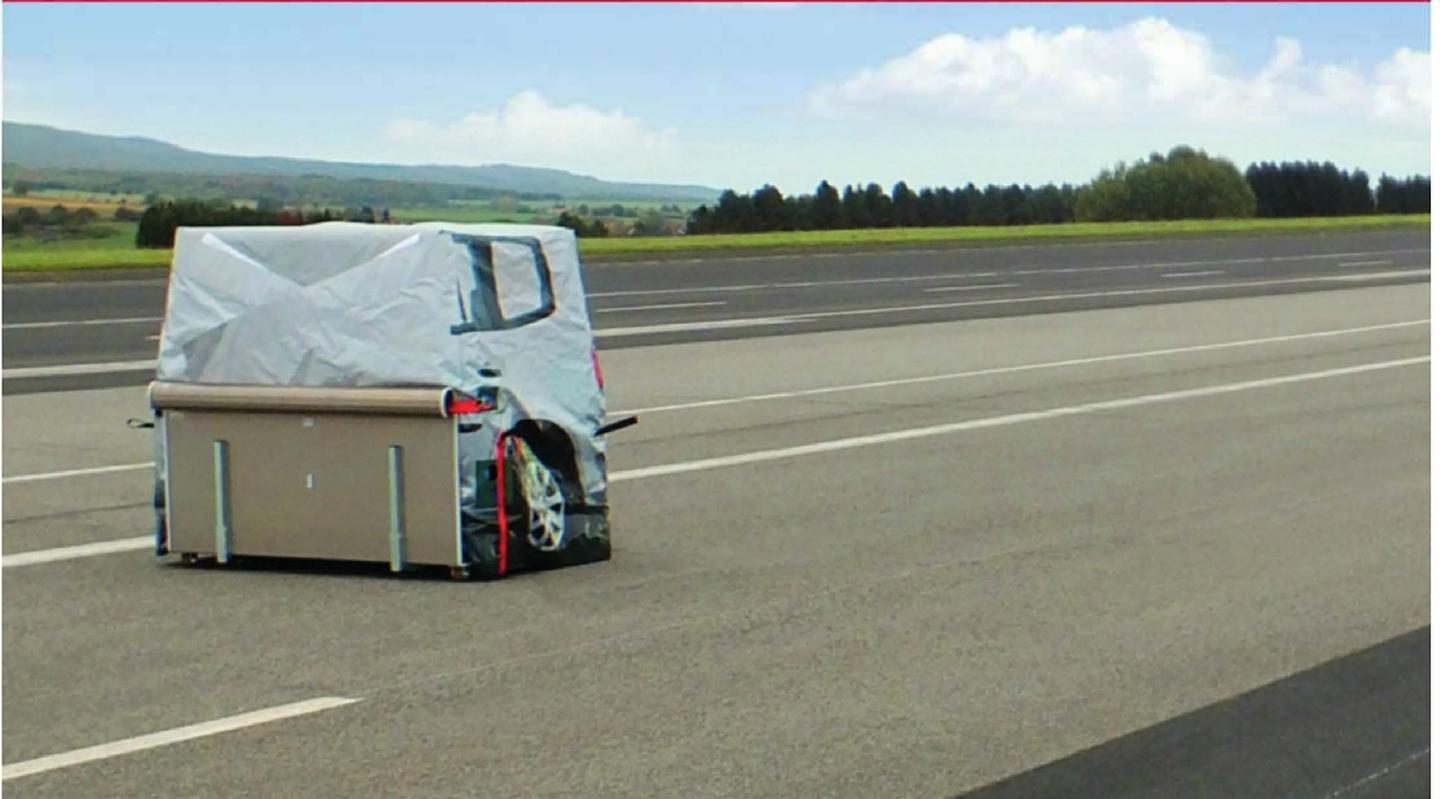
Positioning & guidance by means of sensor fusion, provided by iMAR as complete solutions or in cooperation.



**SOLUTIONS • EASY OPERATION**

# DETERMINING THE PACE

FROM THE IDEA TO MASS PRODUCTION – AND BEYOND



iMAR not only develops and produces stand-alone units for Positioning and Control of vehicles but additionally offers turn-key solutions of complete systems. One example is **iSWACO-ARGUS**. iSWACO-ARGUS is the solution for the verification of the safety relevant features of highly and fully automated driving vehicles. It covers all SAE levels, i.e. from level 0 “hands on” up to level 4 “hands off, mind off - sometimes” and level 5 “hands off, no driver”. **iSWACO-ARGUS** stands for “Swarm Control & Continuous Surveillance” and controls and monitors the motion behaviour of the Vehicle under Test (VUT) as well as all other traffic simulating vehicles (TSV) on the proving ground and gives the unmatched flexibility to generate and execute also precise repeatable tests within real emulated traffic scenarios or even on public roads.



iSWACO-ARGUS contains the navigation and control (iNAT), the iARGUS-VCS vehicle control system for direct control of the vehicle's actuators to follow the desired trajectory, the iARGUS-MV deep-learning assisted machine vision based module for advanced collision avoidance, the mesh based communication system with unmatched low latency (iDMN) for real-time control, and the visualisation and the management of the data obtained during the performed test scenarios (iARGUS-CMD). The iSWACO-ARGUS infrastructure can be installed quickly, simply and safely on arbitrary proving grounds and test vehicles. Thus, it is the testing and automation solution for both, OEMs and testing / homologation organizations.

This scenario, which also covers the guidance and control of swarms, can be applied to many examples and cases of operation, civil and military, on land, at sea and airborne.

Besides the proving grounds, iMAR also offers the layout and equipment of modern container terminals in harbours, comprising the autonomous navigation, guidance and control of container vehicles etc.

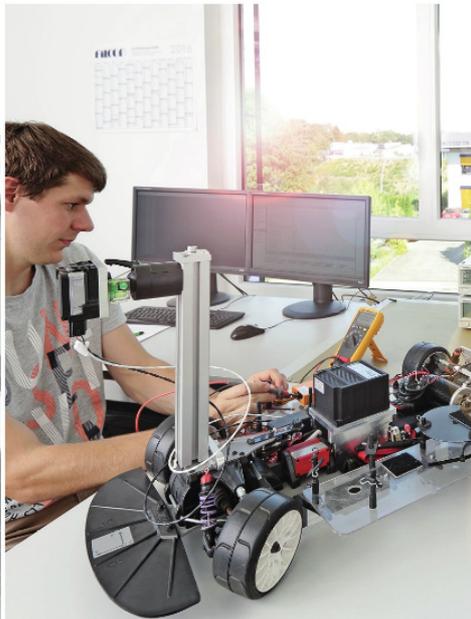
Last but not least, also the landing of an UAV on an unmanned vessel is no more an illusion but reality. Thus, partial and full autonomy are no longer just objectives but iMAR proven reality, using iMAR's centimeter level accurate localisation and control technology.

## Everything from research and development, through manufacturing and integration,

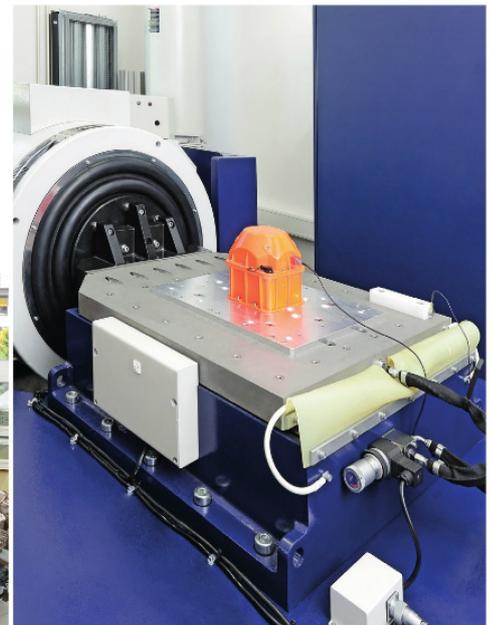
Full autonomy, legally as well as technically and from the logistics point of view means high flexibility and is the basis for a leading technological position of iMAR. We have a great knowledge and expertise in research, development and environmental qualification as well as in the required operating resources grounded for production, integration and testing of our products.



**RESEARCH**



**DEVELOPMENT**



**QUALIFICATION**

**down to qualification and testing in house.  
Engineering and production Made in Germany.**



**MANUFACTURING**



**INTEGRATION**

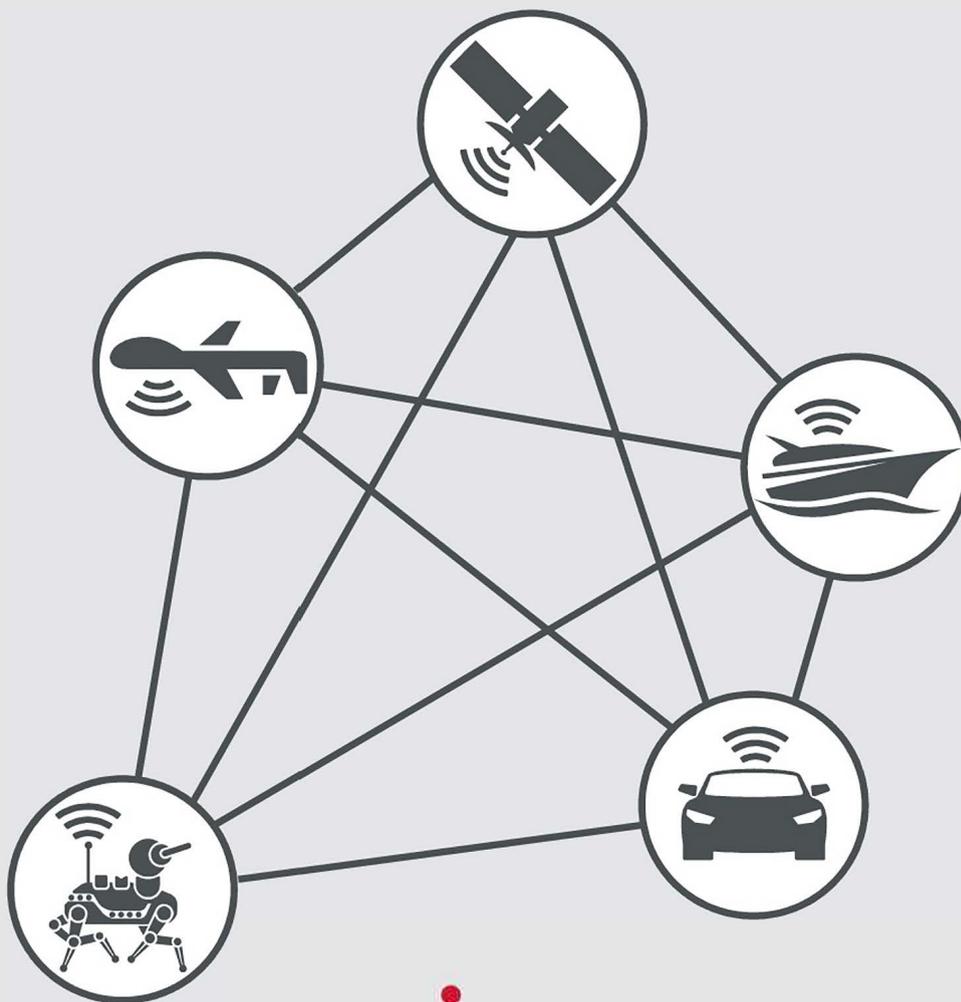


**TESTING**

Quality and flexibility as well as the satisfaction of our customers are iMAR's distinct features which we demonstrate and prove in the diversified fields of application day-after-day.

# DEVELOPING SOLUTIONS FOR THE TASKS OF TODAY AND TOMORROW

**WHATEVER IS YOUR CHALLENGE –  
YOU NAME IT AND WE'LL MASTER IT**



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NAVIGATION & CONTROL

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