

# iXnews

**IXBLUE | APRIL 2019 | DEFENSE SPECIAL ISSUE**

## **DRIX USU**

A new versatile  
unmanned surface vessel

## **THEODOLITE**

Revolutionary GLTS  
with integrated INU

## **MINE WARFARE**

French DGA  
selects Gaps

## **CAESAR SYSTEMS**

iXblue Advans INU  
onboard





As land and naval military operations are conducted in increasingly fast moving and challenging environments, armed forces need to ensure and maintain strategic superiority with optimum efficiency and reliability. At iXblue, our ambition is to bring our customers toward the cutting-edge of navigation, positioning and pointing, and we have developed innovative products and solutions to enable military forces to conduct undisrupted and efficient operations whatever the environment (subsea, surface, land, GNSS-denied areas). Today, iXblue is serving over 60 navies and armies worldwide.

Values of openness and cooperation are at the centre of iXblue's strategy in all the key markets in which the group operates. This position is based on the firm belief that cooperation brings about better innovation more rapidly to the ultimate benefit of our customers. Fast developments in platform design and sensor technology, increasing autonomy and progress in areas such as artificial intelligence in years to come will result in big changes in the land, surface and underwater warfare environment. Indeed, rapid innovation will be necessary to counter the proliferation of conventional and asymmetric threats evolving now and in the future.

iXblue's recent innovations in the area of resilient navigation and acoustic sensor technologies have been recognised and adopted by major naval programs around the world. We highlight in this issue the choice by Naval Group to equip the five new FTI Medium-Size frigates intended for the French Navy with the very high performance Marins Inertial Navigation Systems (INS) and Netans DDU. Likewise, Gaps, our highly-reliable and precise acoustic positioning system has been selected by the DGA for its mine warfare application.

As for the land defense market, iXblue has become a key player offering high performance products and innovative solutions to improve the mobility of armed forces and to boost their observation and targeting capabilities at the best price/performance ratio. In the next few pages, you will learn about our range of scalable and highly-reliable Advans INS and gyrostabilized platforms that have been chosen by major integrators for artillery launchers, armored and tactical vehicles, as well as optronics and radar systems.



**IXBLUE RECENT INNOVATIONS IN THE AREA OF RESILIENT NAVIGATION ARE BEING RECOGNISED IN MAJOR PROGRAMS AROUND THE WORLD.**



Innovation continues in these areas with new concepts of e-positioning and augmented reality intended to aid safer navigation. And with the rising trend toward unmanned and autonomous solutions delivering cost-effective capabilities, the need for increasingly resilient navigation solutions will only grow. iXblue is very active on these fronts. The off-the-shelf Phins Compact range of small low-power inertial navigation systems has been rapidly adopted by many of the world's leading AUV developers and DriX, our unique innovative unmanned surface platform has now conducted many successful operations and is in continuous use in challenging commercial applications. Drix is now attracting considerable interest in naval defense communities for both MCM and innovative ASW applications.

We hope these next pages will trigger your interest and we are looking forward to meeting you and discussing how we can cooperate on your future projects!

**David Cunningham**  
Sales Director



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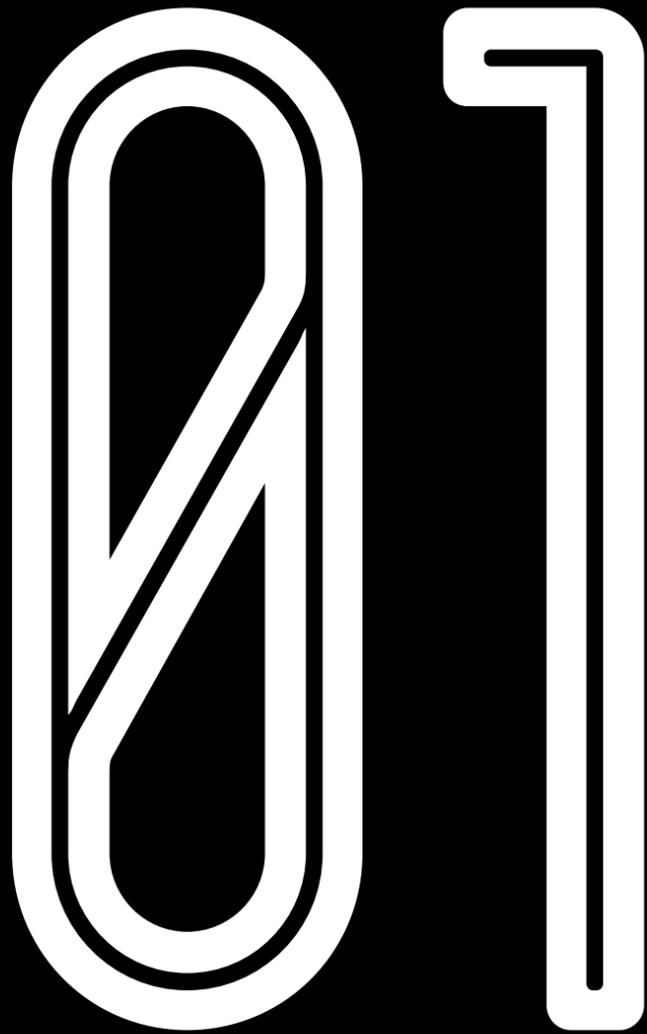
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# RESILIENT NAVIGATION FOR UNDISRUPTED NAVAL OPERATIONS

Navigating in the wide expanses of seas and oceans have always proven difficult. In coastal navigation conditions, crews, who used to depend on sight to get their bearings, could not easily do so as no navigation mark was to be seen for miles. The manual calculations they made using basic, yet efficient, instruments such as magnetic compasses and speed logs, were rough estimates at best and could in no way prepare the crews to the hazards they might encounter on their way.

Technological developments, such as Global Navigation Satellite System (GNSS), inertial sensors, radars and first-generation navigation

software (WECDIS), have brought about safer and more efficient surface and subsea navigation. Nevertheless, limits to those advances have to be identified. Indeed, GNSS availability cannot be assured at all times. Not only is it non-existent undersea for submarines and UUVs (Unmanned Underwater Vehicles) that need to come up to the surface to get their exact position, but the jamming and spoofing of satellite transmission signals are now considered as a common risk by navies around the world.

In this new technological era of navigation warfare, iXblue stands as a trusted partner

that provides the most resilient navigation available to all naval platforms, from surface ships to submarines and AUVs. Navigation information is a critical component of any combat platform as it ensures the vessel's safety and enables the platform to successfully perform its mission. By covering the full value chain of navigation, from the manufacturing of advanced sensors (AHRS, INS, USBL, FLS) and DDU's (Data Distribution Units) to navigation software (WECDIS), iXblue solutions provide reliable and robust navigation information in all conditions, ensuring comprehensive navigational awareness for faster and more efficient decision making.

### Accurate and reliable navigation information brought by advanced sensors

Recognized throughout the world for its pioneering work on Fiber-Optic Gyroscopes (FOG) that have revolutionized navigation over the past 30 years, the advanced technologies mastered by iXblue, ranging from its navigation expertise, to subsea positioning and imagery, have enabled the group to develop state-of-the-art navigation sensors such as AHRS (Attitude and Heading reference Systems), INS (Inertial Navigation Systems), acoustic positioning systems and FLS (Forward Looking Sonars).

Benefitting from iXblue's strap-down and solid-state FOG technology, the group's comprehensive range of navigation systems are exempt of all physical drawbacks that may affect other existing technologies and ensure that resilient navigation information is provided at all times. Robust, they are especially suited to the demanding environments of naval warfare and provide unrivaled reliability and accuracy, offering a pure inertial drift performance up to 1 nautical mile in 360 hours, whatever the MILSPEC-defined environmental conditions encountered (shock, vibration, temperature...).

Accurate navigation of subsea vehicles is furthermore ensured thanks to iXblue's advanced acoustic positioning systems such as Gaps. Offering robust positioning and monitoring information, Gaps USBL (Ultrashort Baseline) system offers very high-precision geo-referenced positioning performance, as well as command and control of the subsea vehicle. Particularly efficient in horizontal tracking, Gaps keeps the mothership well away from the risk area thanks to its wide extensive coverage capabilities and is particularly helpful for mine warfare applications.

Safer navigation is also brought by iXblue thanks to the company's Forward Looking Sonars (FLS) that bring valuable environmental information to the most demanding naval platform. Providing a clear picture of the surrounding environment, iXblue's FLS Series offers highly precise detection and discrimination capabilities thanks to its three-dimensional coverage of the water column, bathymetric profile and seabed and sediment identification. iXblue's 3D multi-beam FLS is thus especially suited for applications, such as mine and obstacle avoidance, real-time mapping and navigation, as well as Rapid Environmental Assessment (REA).

### Navigation information made resilient

Once all the navigation and positioning data has been collected by the various sensors, it is then acquired, analyzed, correlated and distributed to all onboard systems by iXblue's Netans data distribution & processing unit (DDU), that directly interfaces with the ship's combat system and platform management.

Contributing to the vessel operational capabilities, iXblue Netans Series is a real-time system that distributes and processes almost instantaneously the very diverse and highly complex data provided by all navigation sensors. The system will first check the validity of the data provided by the sensors by ensuring that it is coherent with the previously received values. It will then ensure that the data received from one sensor is plausible by checking its coherency compared to the data received from other sensors. The integrity of the data is finally checked by the system that makes sure that there is no alteration during the data transmission. Besides data distribution, the Netans Series, that embeds advanced algorithms, thus provides resilient and reliable navigation information, while addressing the cybersecurity challenges faced by the world's navies.

### Complete navigational awareness helping short-time decision making

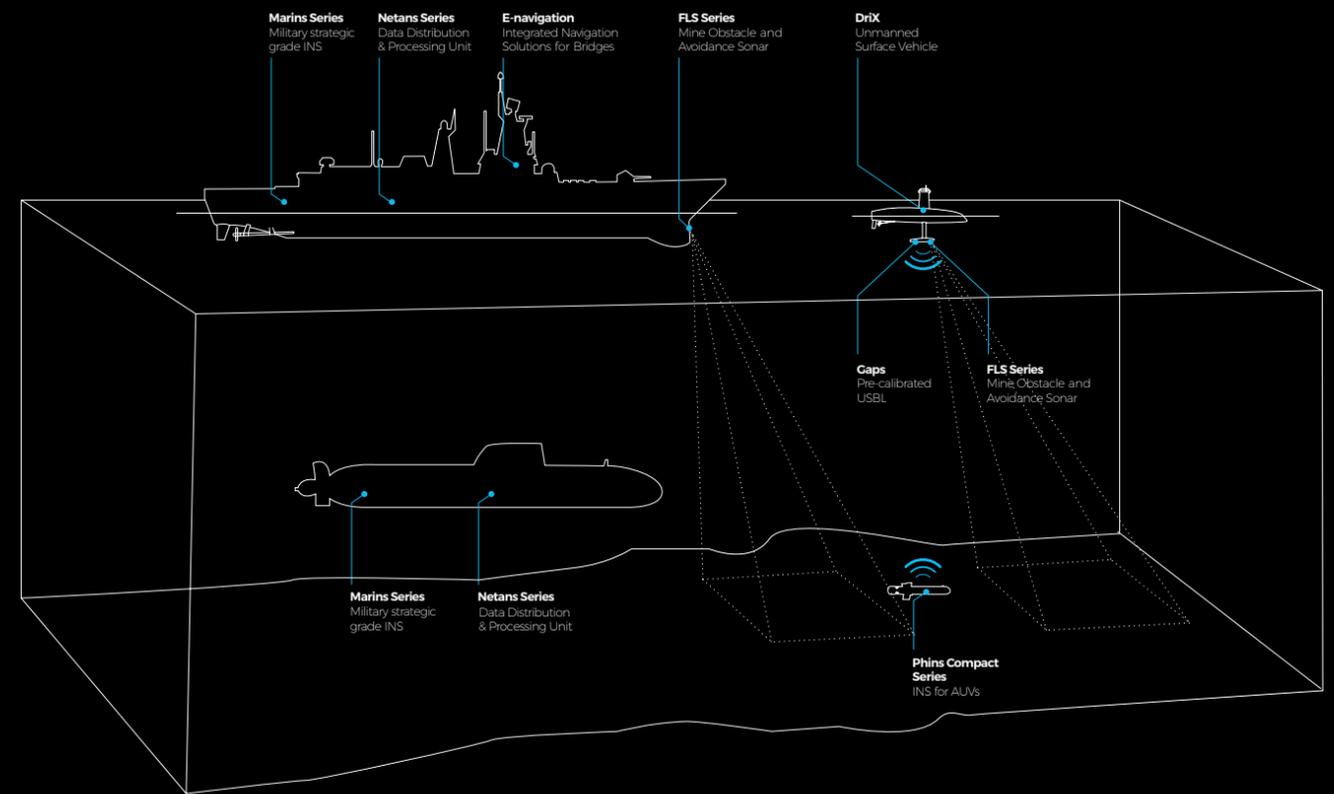
While the navigation information gathered by the various sensors and processed by the Netans DDU is of crucial importance to conduct uninterrupted operations in the challenging naval environment, navigational awareness is just as essential as it brings a much-needed added value to the platform crews. iXblue has thus developed various e-navigation

solutions in order to provide naval forces with a full navigational awareness system (position management, hazard detection and intuitive data display) enhancing the crews' short-time decision making process.

One component of this new e-navigation solution is the e-positioning capability that brings more robust navigation by feeding complementary positioning information to all onboard systems. Indeed, automatic repositioning of the naval platform is brought about by the detection of known navigation marks through radar or LiDAR technology. Additionally, bathymetric repositioning is also made possible thanks to the real-time measurement of water depths through echo sounders. This information is then correlated with existing bathymetric maps to acquire the vessel's exact position. All this data redundancy thus greatly reduces the pool of errors and brings safer navigation to naval platforms thanks to a navigation information that is made extremely robust and accurate.

In parallel to its positioning capabilities, iXblue's e-navigation solution is able, through deep learning and artificial intelligence, to assess potential hazards or vessels and classify them according to various degrees of interests. Qualifying the detected elements thus brings crucial defense capability to naval platforms as it helps them anticipate and react to the potential threats they might encounter.

This qualified and relevant information coming from the massive amount of data collected by the vessel's sensors, can be better appraised by the crews onboard through augmented reality that enables an intuitive and highly intelligible display of all synthesized navigation information. Combined to iXblue's WECDIS (Warship Electronic Chart Display and Information System), an interface that seamlessly displays the navigational and environmental information in a highly interactive way, this new augmented reality display of crucial information brings enhanced navigational awareness. This in turns helps crews to make informed decisions in a reduced timeframe, making it possible to avoid incidents that were until then the results of the profusion of unqualified data and the use of intricate navigational systems. ■



**BY COVERING THE FULL VALUE CHAIN OF NAVIGATION, FROM THE MANUFACTURING OF ADVANCED SENSORS AND DDUS, TO NAVIGATION SOFTWARE, IXBLUE SOLUTIONS PROVIDE RELIABLE AND ROBUST NAVIGATION INFORMATION IN ALL CONDITIONS, ENSURING COMPREHENSIVE NAVIGATIONAL AWARENESS FOR FASTER AND MORE EFFICIENT DECISION MAKING.**





# DRIV

A NEW VERSATILE  
UNMANNED SURFACE  
VESSEL FOR EFFICIENT  
MILITARY OPERATIONS

Launched over a year ago on the civilian market, iXblue's Unmanned Surface Vessel (USV), DriX, proved to be a real game changer and already conducted many successful operations ranging from subsea positioning to bathymetry missions. The Defense community soon identified DriX as a real asset which would bring added value on the battlefield while keeping crews out of harm's way.

Diverging from traditional USVs, DriX offers unmatched seakeeping and high-speed transit capabilities (up to 14 knots) thanks to its highly hydrodynamic hull, along with an enhanced autonomy of up to 10 days. Its sensors-embedded gondola, two meters under the surface, ensures optimal data gathering within an exceptionally calm environment. DriX can furthermore host a wide range of payloads. Thanks to its open architecture, it can be tuned to fit the needs of any military integrator and can be used to conduct diverse military operations.

#### Military Bathymetry

Military bathymetry in peace-time will benefit straight away from everything DriX brings to the market such as enhanced data collection, vessel time savings, and an extended working envelope.

#### Rapid Environmental Assessment (REA)

DriX is also an undeniable asset for REA missions. Able to conduct bathymetry at great speed, it will decrease survey time while ensuring optimal data gathering. Launched by the amphibious force beyond the horizon, DriX is perfect for under-cover operations. It can sail stealthily inside the Area of Operation thanks to its reduced radar cross section and heat signature, while working completely independently from the mothership.

#### Anti-Submarine Warfare (ASW)

DriX is in a unique position to provide a most needed edge to address the submarines' technological evolution and proliferation everywhere on the planet, but also the reduction in the number of specialized frigates and destroyers. Discreet, it can detect or deter potential submarines thanks to its abilities to tow new generation passive arrays, to carry active sources or to be part of a multi-static organization.

#### Mine Warfare (MW)

Thanks to iXblue's knowledge in underwater detection and navigation, DriX is also in a position to conduct Autonomous Underwater Vehicle (AUV) tracking, subsea positioning and detection. As a surface asset, DriX has no communication nor positioning issue. By being geographically close, it can communicate with submerged AUVs and provide them with the accuracy they miss, while also sending back the gathered data to the mine warfare commander.

#### Emergency Disaster Relief

International initiatives were recently encouraged to address the logistic of Emergency Disaster Relief. For coastal countries or islands, this means access from the sea. And one cannot wait for harbor facilities to be rebuilt before sending in help. To that extent, DriX is also a game changer as it can clear a path to access the pier of a damaged harbor. It can also conduct immediate bathymetric damage assessment of the harbor and coastal submerged infrastructures in order to help prioritize the rebuilding phase.

With DriX, iXblue is providing an additional way to conduct maritime operations. Thanks to its LARS, it is either deployed from the coastline, from an amphibious ship dock or from a frigate davit. The system requires few people and its simplicity and efficiency makes DriX as routine and easy to use as a helicopter or a RHIB. Completing and enhancing the existing assets, it brings the Force provision of warning and an extra layer of defense whilst keeping humans in safer environments. ■

# DriX

## UNMANNED SURFACE VESSEL

#### Features

- Design optimized for both coastal and offshore missions
- Removable and replaceable gondola
- DriX Deployment System (DDS) included

#### Benefits

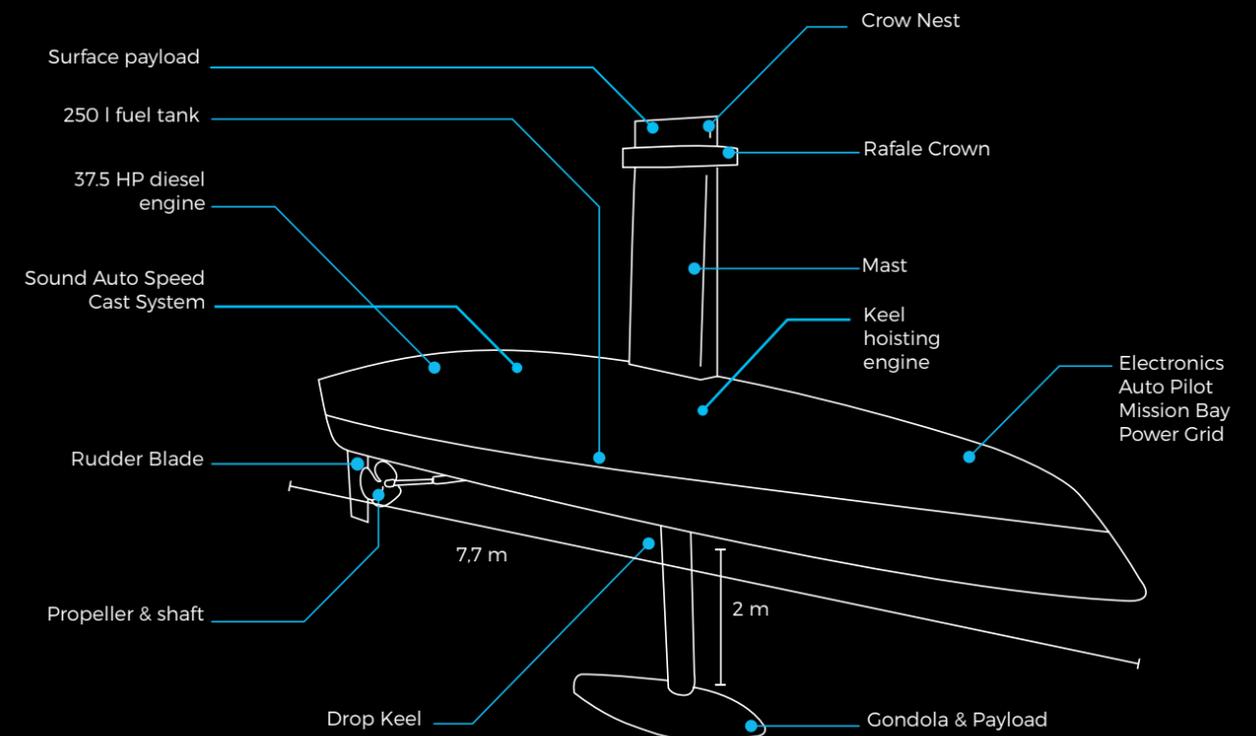
- Sea-proven stability in high sea states
- Excellent manoeuvring capabilities and a wide range of speeds (up to 14 knots)
- Long endurance (up to 10 days)
- Reduced fuel consumption

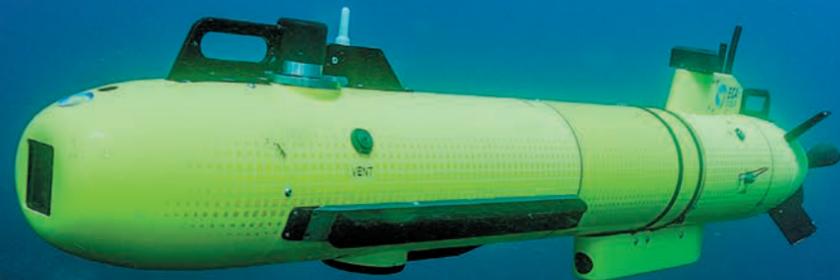
#### Specifications

- Autonomous conduct of pre-planned missions
- Auto-docking inside the DDS
- Remote controlled as a back-up
- Communications:
  - Line of sight
  - Beyond line of sight (SATCOMs & MBR)

#### Military applications

- Military bathymetry
- Rapid Environmental Assessment (REA)
- Anti-submarine warfare
- Mine warfare
- Emergency disaster relief





Courtesy of ECA Group

## PHINS COMPACT SERIES

# MORE ROBUST AUTONOMY FOR ALL AUVS

### The rise of autonomous platforms

Recent years have seen the rise of all types of autonomous vehicles, from Unmanned Aerial Vehicles (UAVs), to untethered Autonomous Underwater Vehicles (AUVs) operating in the challenging subsea environment. Offering a flexible turnkey solution for a wide range of applications, AUVs continue to evolve as a growing, dynamic solution. Able to operate in difficult-to-access as well as hazardous areas where navigation is challenging, AUVs offer a flexible, cost-efficient and safer alternative that acts as a force multiplier and enhances the performance of traditional solutions for various applications including exploration, Metocean, as well as environmental, geophysical, and hydrographic surveys.

“In many regards, AUVs are some of the most, if not the most advanced autonomous platforms in the world. They are the only ones that are always forced to operate in a GNSS-denied environment,” explains Ted Curley, Business Development Manager at iXblue. “This is why the navigation solution is such an essential component. Because the navigation brings such a critical capability, we understand the importance of our position on the market. iXblue is not just a supplier of inertial navigation systems. We believe that we can actually bring more robust autonomy to the platform including a growing importance in providing the positioning solution with our Gaps Global Acoustic Positioning System.”

**Leveraging state-of-the-art expertise in Inertial Navigation Systems (INS), iXblue has developed the Phins Compact Series, a complete range of subsea INS specifically designed to improve accuracy, bring reliable cost-efficient navigation solutions to all AUVs and that is now recognized as a world leader for autonomous navigation.**

### Reliable navigation for enhanced autonomy

iXblue, recognized worldwide throughout the industry for its pioneering work on the development of Fiber-Optic Gyroscope (FOG) technology that has revolutionized maritime Inertial Navigation Systems (INS), has put extensive efforts in R&D to develop new innovative autonomy technologies. A key focus for the company, resilient navigation solutions have thus been developed by iXblue and the company is now considered a major actor of this new autonomous era.

Over the years, iXblue has developed long-lasting partnerships with various key industry players including private companies, research institutes and governments, to fully understand and anticipate the needs of the AUV market in order to remain at the forefront of technological advancements. By truly understanding all specific aspects of the AUV market and its challenges, iXblue was thus able to develop the Phins Compact Series INS, especially designed to offer a scalable and highly accurate and reliable navigation solution that enhances AUVs autonomy.



▲ An AUV is being deployed

### Phins Compact Series: the world leading solution for AUVs navigation

The Phins Compact Series is a genuine strap-down solid-state system free of moving parts that offers quiet and stealth autonomous navigation and does not interfere with sonars and other payloads acoustic noise, while also providing increased autonomy to the subsea platforms thanks to its very low-power consumption. Launched back in May 2016, the Phins Compact Series has since then been chosen by major AUVs manufacturers and integrators to provide reliable autonomous subsea navigation.

Comprising the Phins C3, C5 and C7, the Series offers a fully scalable solution that allows AUVs industry players to choose the Inertial Navigation System the most suited to their needs, whatever the platform's size and mission type. Available in OEM versions, the Phins C3, C5 and C7 share identical architectures and interfaces and incorporate the same algorithms and software, enabling customers to re-use the control system on any other type of AUV via modern interfaces such as Ethernet, reducing initial integration costs. Benefiting from an MTBF (Mean Time Between Failures) of over 100,000 hours, without any need for preventive maintenance, the Phins Compact Series guarantees the highest level of reliability and robustness and is now considered as the standard navigation solution on which AUVs can rely to be fully autonomous.

"iXblue's success on the AUVs market rely on many factors. One is, of course, our unrivaled FOG technology. But another of our strong suits are our advanced algorithms. Everything is about data nowadays, and data is key to highly reliable navigation. We can think of an AUV as being a mix of a lot of very good sensors, including DVL, GPS, USBL and LBL to only name a few. The challenging part to make the platform fully autonomous, is to merge all those data to provide a reliable navigation capability," states Ted Curley. "Thanks to our advanced algorithms and Unscented Kalman Filter, our inertial navigation systems have now become the prime sensor fusion engine, from a navigation, position and timing standpoint. This is why we are able to bring more robust autonomy to those unmanned platforms. Overall, we have the best technology available for the navigation of AUVs today and this translates into the sheer number of iXblue systems that are now roaming the oceans in full autonomy." ■

# Phins Compact Series

MOST COMPACT INERTIAL NAVIGATION SYSTEM FOR AUVs

#### Features

- Most compact high grade INS
- Low power consumption for increased autonomy
- Software and algorithms dedicated for subsea operations
- Genuine strapdown solid-state system

#### Benefits

- Stealth autonomous navigation
- Very accurate heading, roll, pitch speed and position
- Common interfaces
- Seamless integration
- Open architecture with third-party sensors



### Phins C3

#### Performance

- Heading: 0.15 deg
- Roll pitch: 0.05 deg
- Position accuracy: 0.2% DT
- Power consumption: 12 watts

#### Environment characteristics

- Weight: 1.6 kg
- Volume: 0.4 L
- Diameter: 115 mm

#### Electrical interfaces

- Serial: RS 232/422
- Ethernet: UDP/TCP
- Pulse: TTL



### Phins C5

#### Performance

- Heading: 0.05 deg
- Roll pitch: 0.01 deg
- Position accuracy: 0.1% DT
- Power consumption: 20 watts

#### Environment characteristics

- Weight: 4.77 kg
- Volume: 5.9 L
- Diameter: 154 mm

#### Electrical interfaces

- Serial: RS 232/422
- Ethernet: UDP/TCP
- Pulse: TTL



### Phins C7

#### Performance

- Heading: 0.01 deg
- Roll pitch: 0.01 deg
- Position accuracy: 0.05% DT
- Power consumption: 20 watts

#### Environment characteristics

- Weight: 3.5 kg
- Volume: 4.6 L
- Diameter: 200 mm

#### Electrical interfaces

- Serial: RS 232/422
- Ethernet: UDP/TCP
- Pulse: TTL

From 2 to 5 independent input data flows



# INTEGRATED SOLUTIONS FOR HIGH-TEMPO LAND OPERATIONS

As iXblue became a recognized leader in the field of naval navigation over the past decade, equipping 40 marines in the world (US, UK, France, Malaysia...) with state-of-the-art Inertial Navigation Systems (INS) and gyrocompasses, it was a natural continuation for the company to enter the Land Defense market. Indeed, as armed Land Forces face an increasing need for safer and uninterrupted navigation, iXblue's had all the capabilities to address their challenges on the field of operations. Nowadays, GNSS availability and reliability has become a real concern for military forces. Spoofing or jamming are common practice in warfare environments, while in some areas of combat, GNSS may simply not be available. Therefore, GNSS can no longer be the unique tool used for precise location on the battlefield and the need for all vehicles and troops to be able to operate in GNSS-denied environments has dramatically grown. Inertial Navigation Units are the best solution to address this issue.

### Navigation solutions for the full spectrum of land defense applications

In the view of this paradigm shift, iXblue has developed a full range of Inertial Navigation Units (INUs) to respond to the integrators and end-users' new challenges. Benefiting from its expertise in the naval domain, iXblue has made inertial navigation accessible to a wide spectrum of land defense applications (including Blue Forces tracking, artillery launchers, armored and tactical vehicles, as well as optronic and radar systems). Thanks to the mastering of the FOG-technology at the core of iXblue's INUs, the company can offer scalable solutions, covering broad performance needs, from medium grade INUs, compact and cost-effective for combat and auxiliary vehicles, to high-grade INUs dedicated to pointing accuracy for howitzers, radars or observation turrets.

All navigation systems produced by iXblue are strapdown solid-state designed, conceived to withstand severe environments such as extreme shocks, vibrations, sand, dust or rain and provide the robust autonomy, reliability and accuracy required by the most challenging land operations. Beside these operational requirements, iXblue's systems meet industrial integrators needs for cost-effective and easy to integrate equipment. They share strong commonalities with regards to hardware, software and interface, resulting in significant savings in term of integration, installation, configuration, logistics and maintenance costs.

The Advans Series, iXblue's INUs range for Land Forces makes navigating in GNSS-denied environments accessible to all type of vehicles at a low cost of ownership for new and retrofit programs. It has been adopted in numerous defense programs across Europe, South America and the Middle-East, proving iXblue's technology leadership. Indeed, through vertical integration, iXblue develops, manufactures and integrates all critical FOG components, as well as accelerometers and processing boards, enabling the company to be fully independent to adapt, produce and export its INUs for the Land Forces. With this full mastery of the industrial process, iXblue has the capabilities to produce for major land defense programs across the globe. Combat proven, the Advans Series is ITAR-free and only submitted to French Export Control regulation.

### A recognized expertise in line of sight stabilization

Beside navigation solutions, iXblue provides Land Forces with highly gyrostabilized platforms, an essential capability to compensate movements of the ground and to support the use of high performance sensors on vehicles during operations such as communications, data collection and long distance observation. With 30 years of expertise in rotary systems, motion simulators as well as positioning systems, iXblue produces a range of highly reliable and accurate stabilized platforms, that can be dimensioned to match all payload categories required for land defense applications. With its off-the-shelf stabilized platforms range, iXblue can provide customers, in particular for optronics, radars, and weapon system, with products that are easy to integrate and operate.

iXblue two-axis Pos-Series pan-and-tilts (Leos, Neos, Ceos, Kheops) are designed for land applications such as surveillance, data-link, forward observation, weapon stations and panoramic sights. They are able to support up to 3 payloads, for a total weight ranging from 15 kg to 400 kg, with gyrostabilization line of sight from 1mrad down to 20 µrad. All platforms are export-free and MIL-STD ruggedized.

Majors integrators and optronics companies (such as Thales, ArianeGroup, Bertin Instruments...) have chosen iXblue mechatronics expertise for various applications including satellite communication, surveillance, target acquisition and tracking.

### A new territory for innovation

As iXblue has become a growing player in this market, innovation has always been a key priority in order to fit as closely as possible to the clients' needs and being able to adapt quickly to a specific challenge.

For instance, from the need voiced by artillery, iXblue has developed the GLTS Theodolite, an innovative solution, with full navigation capabilities relying on an INU, to perform gun laying, and topography missions. Thanks to this technology, the system offers an immediate support to on-the-move launchers and provides artillery topography and survey teams with high flexibility in the field, even in GNSS-denied environments. The GLTS Theodolite is coupled with Horus, a moving map developed by iXblue and dedicated to artillery operations.

Still attentive to its customers' needs and to match the high-tempo of operations on the field, iXblue is also developing a new concept of target acquisition, the Navigation and Targeting Locator Rifle, a light pointing system, which combines a telemeter and an INU, on which any type of portable camera can be mounted. The system allows the operator to quickly designate the target and reduces decision making time.

Lastly, still anticipating tomorrows needs for troops on the fields, especially for pedestrian soldiers or special forces, our lines of research lay in new challenges such as light Inertial Navigation System for pedestrian or indoor use. As such, iXblue, in partnership with the ONERA (the French Areospace Lab), is taking part in the MALIN challenge organized by the DGA and the ANR (French National Research Agency) to develop a mixed inertial/vision solution for civilian or military pedestrians moving in a non-cooperative or hostile environment with a need for a metric localization precision and an environment mapping, easy-to-use and as cheap as possible.

Nowadays, not only is iXblue a recognized player in the Land Defense market, it also stands out as an agile and very active innovator to develop off-the-shelf and tailored solutions to land forces. ■

# POS Series

## STABILIZED PLATFORMS

### Ceos

Two-axis gyrostabilized platform for single payload

Gyrostabilized line of sight: <1mrad  
Nominal payload: up to 15 kg



### Neos

Two-axis gyrostabilized platform for single payload

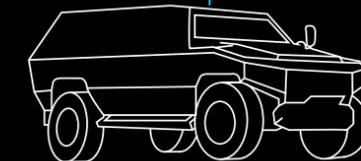
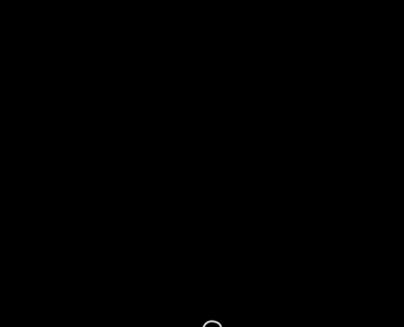
Gyrostabilized line of sight: <1mrad  
Nominal payload: up to 40 kg



### Leos

Highly accurate two-axis gyrostabilized platform for optronic sensors

Gyrostabilized line of sight: <20 µrad  
Nominal payload: up to 20 kg



**Advans Ursa**  
High grade INU for blue forces tracking

Horizontal position without GNSS: 0.7 % DT  
Accuracy: 4 mils  
Roll & pitch: 2 mils



**Advans Lyra**  
High grade INU for tactical vehicles

Horizontal position without GNSS: 0.3 % DT  
Accuracy: 1 mils  
Roll & pitch: 0.5 mils



**Advans Vega**  
High grade INU for artillery and radars

Horizontal position without GNSS: 0.1 % DT  
Accuracy: 0.5 mils  
Roll & pitch: 0.2 mils

# Advans Series

## INERTIAL NAVIGATION UNITS



# NEW REVOLUTIONARY THEODOLITE WITH INTEGRATED INS ALLOWS FOR UNDISRUPTED MILITARY OPERATIONS

Military tactical operations and deployment of troops are becoming more and more complex as armed conflicts escalate to new heights. There is an ever increasing need for the precise location of troops and military units on battlefields who have to move quickly and effectively in order to conduct uninterrupted military operations on foreign ground. It is to meet the demanding requirements of army topographers and artillery troops on the field that iXblue has developed a revolutionary Gun Laying and Topographic System named Advans Theodolite - GLTS. Based on the combat-proven concept of the traditional artillery theodolite, iXblue's Advans Theodolite ensures continuous military operations by offering reliable, accurate and uninterrupted positioning information thanks to its integrated compact Inertial Navigation Units (INU).

**A light-weight and deployable system capable of rapidly gathering data for GIS**

As military forces conduct operations in increasingly demanding environments, the need for accurate and reliable topographical information is becoming indispensable. The use of Geographical Information Systems (GIS) by most armies around the world has made military decision making more efficient as those systems provide valuable information about the geographical elements of an identified area. Military forces thus need to find the most up-to-date geographical information in those GIS in order to safely and efficiently conduct their operations.

Forces on the field are thus in serious need of light-weight and deployable acquisition modules capable of acquiring geo-referenced information at very short notice in order to have a good understanding of all the geographical elements of the environment they are progressing in during their military operations. iXblue's Advans Theodolite - GLTS was thus developed to respond to this specific need and offers armed forces a mobile and flexible solution to efficiently and rapidly elaborate topography referenced points on the battlefield. Its light-weight (less than 40kg) and integrated INU makes it ideal for any survey operation requiring a deployable system that can travel in a vehicle or be mounted on the floor and be ready to use within a few seconds (<15s).

**An integrated INS for artillery continuous deployment in GNSS-denied environments**

Military operations have been made more efficient thanks to the use of Global Navigation Satellite System (GNSS). Although they have transformed the way military operations are conducted, enabling real-time and almost continuous situational awareness by providing precise positioning information, recent years have seen the rise of a growing concern about the dependence of military forces on GNSS.

Indeed, its availability cannot be assured at all times and many factors can lead to the disruption of satellite transmissions, on which the GNSS rely. RF interferences, geographical constraints or signal jamming by third parties are all factors that poses a major threat to military operations worldwide. This frequent loss of signal is thus a major concern for artillery units who are now relying on INU to replace GPS as the main navigation devices. Indeed, they offer a robust, reliable and accurate solution to military vehicles and deployed units that need continuous and precise navigation and positioning information for artillery.

Moreover, artillery topography units are also rediscovering topography methods and now use them to generate topography battery reference points for battery deployment. Thanks to the Advans Theodolite - GLTS integrated INU, missions conducted by military topographers are dramatically sped up, making battery deployment free of the constraints linked to the creation of battery reference points, even in case of total GNSS-loss.

Benefiting from the strong expertise of iXblue in the design and manufacturing of state-of-the-art Fiber-Optic Gyroscopes (FOGs), the Theodolite's INU, operating in numerous defense programs across Europe, South America and the Middle East, is indeed made insensitive to changes in temperatures or magnetic disturbances and is resistant to extreme shocks and vibrations. Thanks to its genuine strap-down and solid-state design, it is exempt of all the physical drawbacks that can affect other existing technologies and provides unrivaled longevity and reliability, as well as very low power consumption. Thanks to its integrated INU, iXblue's Advans Theodolite - GLTS thus provides reliable, accurate and uninterrupted positioning information, ensuring continuous military operations for all armed forces on the battleground.

**A single cost-efficient solution to digitize old artillery launchers**

Finally, the major technological advances that have been taking place in the world have allowed increased digitized warfare to support command and control and to provide real-time battlefield intelligence. In order to meet the 21<sup>st</sup> century challenges, countries worldwide have to modernize their military forces and upgrade their systems, equipment and weapons. New artillery launchers such as howitzers, mortars and Multiple Launch Rocket Systems (MLRS) are thus now equipped with their own INU that provide precise positioning of each units, making them ready for immediate use.

However, digitizing old artillery launchers can prove to be difficult. Units might be too old, or it might be technically impossible to integrate an INU. Another reason is that armed forces can also be tied down by budget constraints. Thanks to iXblue's Advans Theodolite - GLTS, compatible with any kind of weapon, it is now possible for armed forces to digitize their artillery launcher units by using a single cost-efficient system. Indeed, the Advans Theodolite - GLTS, thanks to the constant knowledge of its position, can perform accurate gun orientation and positioning at very short notice, even in non-prepared battery positions, with a precision close to that of INU-equipped units, at a much lesser cost.

iXblue's Advans Theodolite - GLTS thus offers a performant and reliable tool to conduct various missions such as rapidly and efficiently elaborating topography referenced points on the battlefield, maintaining gun position accuracy and high-tempo of operation in GNSS-denied environments, as well as controlling gun laying or performing accurate gun orientation and positioning in a reduced timeframe, while digitizing old artillery launchers units. Easy to integrate on any vehicle and to connect to GIS, the Advans Theodolite - GLTS offers a very flexible, mobile and cost-effective revolutionary solution to army topographers and artillery troops needing a reliable and efficient tool for their operations. ■

# Advans Theodolite - GLTS

INNOVATIVE SYSTEM FOR GUN LAYING AND TOPOGRAPHY

**Features**

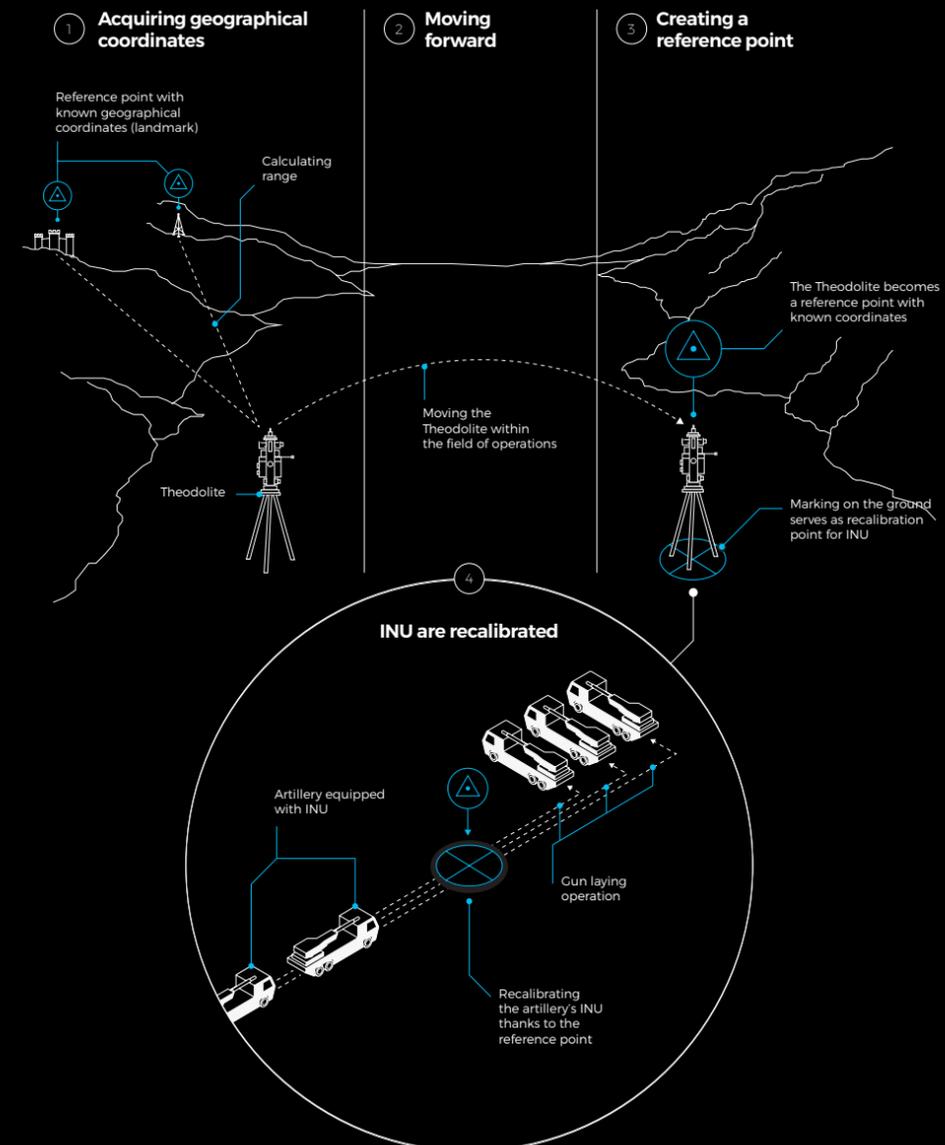
- Gun laying and gun control (positioning and orientation of artillery launchers and mortars)
- Artillery topography
- Military route survey

**Benefits**

- French in-house technology
- Fast deployment outside of the vehicle (<30s) and immediate response
- Easy-to-use with a complete embedded system
- Robust to GNSS denied-environment and GNSS spoofing
- Easy to integrate on any opportunity vehicle, and compatible with any fire control system

**Technical specifications**

- Excursion range:
  - Elevation: +60°/-20°
  - Azimuth: unlimited
- Distance measurement range: 30m to 6100m (4600m on NATO target)
- Distance measurement accuracy: ≤1 m at nominal range
- Optical field (optical sight): 80 mil
- Autonomy: 8 hrs at 20°C



# MODULE FOR TARGET LOCATOR FOR HIGH TEMPO FORWARD OPERATIONS

Joint Terminal Attack Controllers (JTACs), Forward Air Controllers (FACs) and Forward Observers (FOs) are all of crucial importance for the success of efficient military operations as they bring highly valued and essential coordination with ground forces during direct offensive air operations and fire onto a precise target.

Because of the very nature of their missions, that include surveillance, target acquisition and coordinates extraction, those units conduct operations on forward locations, dangerously close to the enemy, where armies are engaged in conflict. They are thus particularly vulnerable to the enemy fire and need to maintain a very high tempo of operations in order to successfully and safely complete their missions.

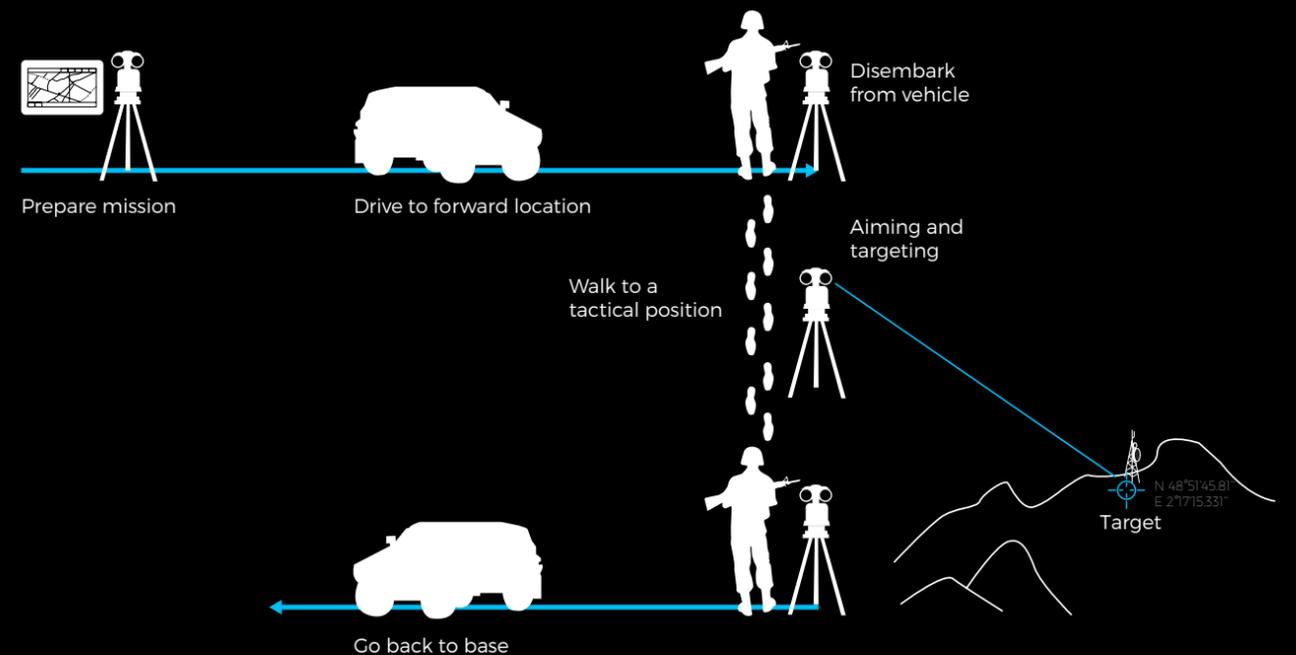
It is to help them increase their survivability and the efficiency of their operations that iXblue has developed an innovative and revolutionary inertial module for Target Locator.

Especially designed to reinvent the traditional solution currently used by forward military forces and that requires them to make use of various instruments such as laser range finders, goniometers and north finders, this new module for Target Locator offers a compact and lightweight all-in-one solution that can fit all handheld thermal imagers. It can be carried into a backpack and enables military forces to reduce operations time and provides uninterrupted navigation information.

While the traditional solution currently used by JTACs, FACs and FOs requires time on the field for the set-up and calibration of north finders and can be subjected to the loss of GNSS-signal, iXblue's revolutionary Inertial Module for Target Locator bypasses all those constraints. Indeed this new solution, with its integrated INU (Inertial Navigation Unit), does not require any calibration, nor does it need the use of north finders or GPS, saving exponential time as the INU provides accurate positioning information at all times and is instantly ready to use, even in GNSS denied-environments. ■



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# 02

# CUSTOMER STORIES

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# THE FRENCH DGA CHOOSES IXBLUE'S GAPS ACOUSTIC POSITIONING SYSTEM FOR ITS MINE WARFARE APPLICATIONS

The French General Directorate of Armament for Technical Naval Applications (DGA Technique Navales – DGA/TN, formerly GESMA), an entity specialized in experimentation in the area of mine warfare, has selected iXblue's Gaps acoustic positioning system for its Autonomous Underwater Vehicle (AUV) positioning and monitoring applications.

«The choice of Gaps by the DGA/TN, which is the reference in France in the area of mine warfare, is a clear mark of the confidence placed in our underwater positioning technology», explains Hubert Pelletier, Head of the Acoustics Division of iXblue. «This contract, which further strengthens a longstanding working relationship with the DGA/TN, is testimony to the quality and reliability of our Gaps acoustic positioning system for strategic military applications such as mine warfare.»

Incorporating iXblue's Phins Inertial Navigation System, the Gaps system is equipped with a pre-calibrated USBL (Ultra Short Base Line) antenna and offers very high-precision geo-referenced positioning

performance, particularly in shallow waters and in noisy environments. Its telemetry function also allows for the recalibration of the Inertial Navigation Systems (INS) on board the underwater vehicle thanks to an acoustic communication link, as well as for the command and control of the AUV. The broad opening of its 3D antenna, up to as much as 200 degrees, also gives it unrivaled capacity in terms of horizontal tracking, enabling the system to cover a very extensive area and keep the mothership well away from the area of risk. Compact and lightweight, Gaps is very easy to use and integrate and can be installed on different types of platforms (hulls of ships, hoisting systems, poles, buoys, surface drones).

This new contract announced by the DGA/TN confirms the success that iXblue's acoustic positioning system has been experiencing over the last few years. Gaps has already been adopted by more than 120 key players in the military and civil sectors worldwide, and has thus established itself, in recent years, as a leading product for operations requiring the precise positioning of underwater vehicles, towed fish and divers. ■



THEY CHOSE  
**IXBLUE'S** MECHATRONIC  
**EXPERTISE**

Over the past 30 years, iXblue has developed an extensive know-how in the development of rotary systems, motion simulators as well as positioning systems. This unrivaled expertise in mechatronics and navigation technologies has enabled the company to design and manufacture innovative and high-performance stabilization and pointing platforms for the defense and security market. Thanks to its recognized expertise, iXblue technology has now been chosen to provide reliable stabilization, accurate pointing (both absolute and relative), as well as precise positioning and orientation to numerous military forces, police and security services worldwide. iXblue mechatronic expertise has thus been chosen by major integrators and optronic companies for various applications including satellite communication, surveillance, target acquisition and tracking.

#### **Thales Group**

Recognized as a global leader on the mechatronic market, iXblue has been working for over 14 years now in close partnership, with Thales Communications and Security, on the development of special custom programs, for the co-design, the expertise or the subcontracting of the manufacturing of various stabilized solutions. Being able to work on very demanding projects with high-level of requirements while remaining reactive and bringing strong support to its customers, iXblue was thus chosen by Thales Communications and Security for the development of stabilization solutions for both land and air SATCOM on-the-move applications. iXblue has also been working in close cooperation with another branch of the French Group, Thales Land and Air System to provide them with the Ceos platform, for the reliable stabilization and accurate pointing of their Margot 3000 VM optronic surveillance system, for which iXblue has delivered over 200 platforms.

“Margot 3000 VM is a successful mobile surveillance product for Thales. Several

hundreds of systems have been delivered to our customers over the past five years.” explains Frédéric Le Gusquet, Product Development Manager at Thales Land & Air Systems. “We would like to thank iXblue for supplying the Ceos stabilized platform, part of Margot 3000 VM, and for complying to the delivery schedule with a high-level of quality.”

#### **ArianeGroup**

Thales is not the only group convinced by iXblue’s mechatronic expertise. Other major companies have indeed also decided to trust iXblue’s stabilization and pointing technology for their programs, including ArianeGroup subsidiary, CILAS, specialized in laser and optics technology, for its SLD 500 pre-shot sniper detectors.

“Sight laser detection (SLD) is a proven technology now used on various battlefields. For one of our SLD500 we are using iXblue’s Neos. In order to properly localize the sniper threats it is indeed necessary to use a turret with a high-level of repeatability in position (azimuth or elevation). Neos perfectly matches



this requirements.” States Patrick Patin, Program Manager at CILAS ArianeGroup.

#### **Bertin Instruments**

iXblue’s technology can also be found on Bertin Instruments’ Second Sight MS long range chemical and toxic gas clouds detector used by both military and civil security forces, as well as for other sensors the company develops for CBRN (chemical, biological, radiological and nuclear) applications.

“Bertin has been developing new sensors solutions for observation and surveillance for many years. In order to keep DRI performance at the best level even while on the move in very harsh conditions, we have chosen iXblue new pan & tilt Leos.” Explains Jean-Luc Ménager, Operations Manager at Bertin Instruments. “Thanks to the very high level of gyrostabilization of this turret (<20µrad), we get unrivaled performance to offer cutting edge optronic sight.”

#### **OIP Sensor Systems**

Stefaan Verschraegen, Program Manager at OIP Sensor Systems, a major manufacturer of

electro optical systems dedicated to the defense and space markets, that has chosen iXblue’s technology for its well-known EOPTRIS product range adds: “The Leos pan & tilt makes it possible for the EOPTRIS 360 to achieve a very precise pointing position and gyrostabilization while driving main battle tanks and armored fighting vehicles. Thanks to the highly accurate dual-axis gyrostabilization of the Leos pan & tilt, combined with OIP’s wide range of advanced sensors, we are able to provide a 24-hour observation and surveillance capability to suit different land and naval applications. Due to the open, robust, very compact and state-of-the-art design of the EOPTRIS 360, it can easily be integrated onto multiple chassis and platforms.”

Over the years, iXblue has become a trusted mechatronic partner for major integrators, optronicians, radar manufacturers as well as data link providers operating on the demanding defense market and who are in need of cost-efficient high-performance gyro-stabilized platforms for their payloads. ■

NAVAL GROUP CHOOSES IXBLUE  
TO SUPPLY NEW NAVIGATION SYSTEMS FOR FRANCE'S  
**FUTURE HIGH-TECH FTI**  
MEDIUM-SIZE FRIGATES



Back in November 2017, iXblue was selected by Naval Group to equip the five new FTI Medium-Size frigates intended for the French Navy. With a delivery planned at the end of 2023, the FTI frigates are a new breed of digitally enabled vessels and will benefit from the most advanced technology available to naval forces today. Responsible for the development of these frigates, Naval Group has signed a contract with iXblue for the acquisition of Marins inertial navigation systems and Netans data distribution & processing units to equip these five new generation frigates.

«iXblue is proud to have received Naval Group's strong vote of confidence in awarding us a contract on this major state-of-the-art program for the renewal of French naval forces», explains Thomas Buret, Head of the Inertial Systems and Applications Division at iXblue. «This contract is the outcome of a long-standing collaboration with Naval Group with whom we are working on several export programs. However, it is the first time that iXblue systems have been chosen by Naval Group to equip a new-built major combat vessel for the French Navy. This contract underlines the quality and reliability of iXblue navigation systems, which have become a standard on the naval defense market.»

Indeed, the Marins units offer high-end inertial navigation capabilities meeting the military requirements of the most modern combat ships. Based on iXblue Fiber-Optic Gyroscope technology, the Marins inertial navigation systems offer very high performance levels and provide very accurate position, heading, roll, pitch and speed information regardless of the environment, including GNSS denied environments.

At the heart of the navigation system, the Netans data distribution & processing unit interfaces directly with the ship's sensors, acquiring, analyzing, correlating and then distributing data to all onboard systems. Directly contributing to the vessel operational capabilities, iXblue Netans Series is a real-time system that distributes and processes almost instantaneously the diverse and complex data from all navigation sensors. The Netans range thus provides reliable, consistent and accurate navigation information, while addressing the cybersecurity challenges faced by the world's leading navies.

“Naval cybersecurity is of paramount importance nowadays, as new vessels are being increasingly connected and digitized. The risk of cyberattacks now poses a major threat to this new kind of vessels and the cyber defense capability has become a critical component for any vessel,” states Thomas Buret. “iXblue systems are particularly adapted to high-tech vessels as they provide the most robust protection against sophisticated malwares threats. By providing an architecture capable of managing and controlling that threat, iXblue truly leads the way in cyber secured navigation systems.”

Integrated onto a single platform, the Marins navigation systems and Netans distribution & processing units thus precisely match the exacting requirements of major combat vessels in terms of performance, capacity and cost of ownership. iXblue navigation systems incidentally already equip over 40 navies and coast guards around the world, including some of the most recent and renowned naval programs such as the Royal Navy Astute-class nuclear attack submarines, Queen Elizabeth-class aircraft carrier, Duke-class frigates and Vanguard and Trafalgar-class nuclear-powered ballistic missile submarines, as well as the German Navy Type 123 Brandenburg-class and Type 122 Bremen-class frigates and the Swedish Navy next generation A26 and Gotland-class submarines. This contract awarded by Naval Group for the new FTI Medium-Size frigates program thus keeps reinforcing the presence of iXblue on the naval market and further establishes the group's positioning as a global leading player in the field of navigation. ■



**INTEGRATED ONTO A SINGLE PLATFORM, THE MARINS NAVIGATION SYSTEMS AND NETANS DISTRIBUTION & PROCESSING UNITS PRECISELY MATCH THE EXACTING REQUIREMENTS OF MAJOR COMBAT VESSELS IN TERMS OF PERFORMANCE, CAPACITY AND COST OF OWNERSHIP.**





# NEXTER'S CAESAR® SYSTEMS EQUIPPED WITH IXBLUE'S INS TECHNOLOGY

iXblue's high-grade Inertial Navigation Systems (INS), that provide accurate and reliable positioning and pointing for land defense applications, the Advans Series, has been chosen by Nexter to equip its renowned 155 mm CAESAR® self-propelled howitzer on various export programs.

This choice made by Nexter is the product of a longstanding partnership established between the global land defense systems manufacturer and iXblue, with many of the company's INS equipping Nexter's wide range of howitzers, including the integrator's LG1 105 mm howitzer.

"The fact that iXblue's Advans Series INS have been chosen by Nexter, a global leader on the land defense market, for various export programs, including CAESAR®, is a big vote of confidence for us," states Jean-Marc Binois, Sales Director at iXblue. "It underlines the excellence of our systems in terms of performance, reliability and cost of ownership. This success also reflects iXblue's values of innovation, excellence and strong commitment to our partners. We are very proud of the trust that Nexter puts in our company."

Offering a wide range of products to meet the various needs of military forces in terms of performance, iXblue's Advans Series can be mounted on both new and retrofit programs. iXblue's high-grade INS can thus be selected to modernize various types of howitzers ranging from light-weight towed howitzers such as the 105 mm M101, 122 mm D-30, to heavier 152 mm or 155 mm howitzers such as the M198 or M109. ■



# IXBLUE CONTINUES TO SUPPORT THE U.S. COAST GUARD (USCG)

iXblue Defense Systems (iXblue SAS's U.S. Defense Subsidiary) received a "Sole Source" maintenance contract renewal to continue its support of the 102 Protector Class 87' and Island Class 110' USCG Patrol Boats relying on iXblue's Octans Fiber-Optic Gyroscopes (FOG). The 2018 contract is for a base year and 4 option years and is fully funded to cover repairs and upgrades of these USCG Patrol Boat's Octans FOG through 2023.

iXblue Defense Systems is conducting installation check-out and crew training for the U.S. Coast Guard (USCG) Ice Breaking Tug Thunder Bay (WTGB 108) as she completes

her shipyard availability in Baltimore Maryland. Thunder Bay is the seventh of nine Bay Class Ice Breaking Tugs to receive one of iXblue's Octans Fiber-Optic Gyroscopes and NavBox Digital Distribution Units (DDU) as part of the classes' service life extension program. The installation of Thunder Bay's Octans brings the number of Octans in service onboard USCG vessels to 109 Fiber-Optic Gyroscopes.

iXblue is proud of its continued support of the U.S. Coast Guard and looks forward to continuing its tradition of innovation, performance, reliability and 24/7 support of the U.S. Coast Guard far into the future. ■



# IXBLUE'S ADVANS VEGA INS

## CHOSEN BY JUGOIMPORT-SDPR FOR NEW EXPORT CONTRACT

iXblue has been awarded by the Serbian defense company Jugoimport-SDPR with a contract to provide over 24 Advans Vega Inertial Navigation Systems (INS) for the accurate positioning and pointing of its new Nora 155mm howitzers.

### **High-performance and easy to integrate INS for GNSS denied-environments**

iXblue's Advans Vega INS was chosen by Jugoimport-SDPR to replace the current technology already in use on the Nora 155mm howitzers, after undergoing comprehensive testings. It was selected over competing INS not only for its high-performance or price but also for the easy-integration of iXblue's INS and the outstanding support delivered by the company's engineers during the project.

"Jugoimport SDPR is one of the largest European artillery manufacturers. Our selection procedure for technology partners is very rigid", states Aleksandar Lijakovic, Sales Director and Member of the Board of Directors of Jugoimport SPDR. "iXblue was selected after several months of testing in which the Advans Vega was exposed to the

greatest stresses and maintained remarkable precision. We hope that this partnership between Jugoimport SDPR and iXblue will grow into a long-term strategic cooperation."

Benefiting from the strong expertise of iXblue in the design and manufacturing of state-of-the-art Fiber-Optic Gyroscopes (FOG), the Advans Vega INS is intended for new and retrofit programs on the land defense market. It delivers unrivaled performance and reliability in extreme environments (temperature changes, magnetic disturbances, shocks and vibrations), including GNSS-denied ones. Thanks to its genuine strap-down and solid-state design, it provides unrivaled longevity and reliability and does not require preventive maintenance.

"This contract awarded by Jugoimport-SDPR continues to attest to the advanced quality of our products on the land defense market and further strengthens our leadership in navigation technologies," explains Jean-Marc Binois, Sales Director at iXblue. "The Advans Vega system was considered the most

advanced and innovative by Jugoimport-SDPR. We are proud of the trust they put in our products and look forward to future collaboration with them."

### **iXblue strengthens its position in the Land Defense market**

This new contract confirms iXblue's growing presence on the Land Defense market and further cements the company's position as one of the leading Inertial Navigation Systems supplier, with Advans Series INS operating in numerous defense programs across Europe, South America and the Middle-East. Combat-proven and ITAR-Free, the Advans Series has furthermore been selected for all types of land defense applications, from artillery launchers (howitzer, mortars, MLRS) to armored vehicles, including optronics and radars. References include Nexter with the 155 mm CAESAR self-propelled howitzer, Thales Raytheon Systems, NATO's long-standing trusted collaborator, with the MARTHA radars for the French Army, or Hensoldt, a market leader in civilian and military sensor solutions, for the equipment of its air defense radars. ■

