

## What are the effects of the pandemic on the high-end inertial sensor market?<sup>1</sup>

### COVID-19 OUTBREAK - OUTLINES:

- Yole Développement (Yole) sees the high-end inertial system market experiencing a 2.7% annual growth rate, reaching US\$3.80 billion in 2025.
- The market for accelerometers, gyroscopes, IMU, INS is still fragmented, with many applications.
- With COVID-19 outbreak, Yole announces negative impacts on several market segments: Commercial aerospace will be the hardest hit, contracting drastically in 2020... Commercial naval applications will be negatively affected in 2020 but resume growth in 2021 at 2% annually up to 2025. Industrial applications will be slightly affected in 2020 mostly due to supply chain problems. But the story will not stop here.

*“In 2020, the COVID-19 pandemic has drastically affected all end-markets with various outlooks” asserts **Dimitrios Damianos, PhD, Technology and Market Analyst, within the Photonics and Sensing division at Yole Développement (Yole).** “Indeed, in 2019, Yole estimated that the global high-end inertial systems market was worth US\$3.24 billion, which remains highly fragmented with many applications. In general, 2019 was a very good year for the aerospace and defense industries”.*

The estimated global defense/military spending was approximately US\$1,800 billion according to the SIPRI<sup>2</sup>, with the US accounting for a record US\$760 billion defense expenditure. High-end inertial units are one of the key components in these systems, for navigation, stabilization and other purposes.

The defense market expects no significant effect, since military programs are still running and budgets have already been allocated. There could possibly be some delay in shipments due to supply chain/logistics problems which could hinder annual growth. Nevertheless, there is a strong interest in resilient PNT<sup>3</sup> solutions for GPS-denied environments and against GPS-jamming, when navigation is of paramount importance in critical missions.

In this context, Yole releases an updated version of the [High-End Inertial Sensors for Defense, Aerospace and Industrial Applications 2020 report](#), including updated forecasts of

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<sup>1</sup> Extracted from:

- [High-End Inertial Sensors for Defense, Aerospace and Industrial Applications 2020](#), Yole Développement 2020
- [Sensoror STIM318 Inertial Measurement Unit \(IMU\)](#), System Plus Consulting, 2020
- [Safran Colibrys MS1010 and MEMSIC MXA2500M High-End Accelerometers](#), System Plus Consulting, 2020

<sup>2</sup> SIPRI : Stockholm International Peace Research Institute

<sup>3</sup> PNT : Positioning, Navigation and Timing

volumes, market values and ASP<sup>4</sup> of gyroscopes, accelerometers, IMU<sup>5</sup> and INS<sup>6</sup>. An updated version of the supply chain, and adjustments of end-system volumes are also part of this new study.

In addition, Yole’s partner, the technology and cost analysis company System Plus Consulting, delivers two dedicated reports:

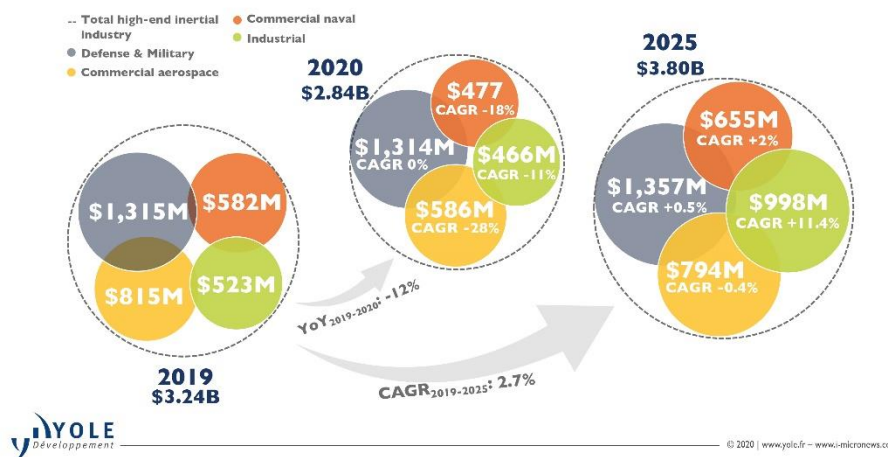
- Sensoror STIM318 Inertial Measurement Unit (IMU)
- Safran Colibrys MSI010 and MEMSIC MXA2500M High-End Accelerometers

Yole and System Plus Consulting shed lights on the post COVID-19 High-end inertial sensors industry.

According to **Guillaume Girardin, PhD, Director of the Photonics and Sensing Division at Yole**: “The future for commercial aerospace looks grim. Air travel has paralyzed due to the pandemic and future plane orders have been revised downwards. For sure, long-range wide-body aircraft will suffer. There is a ray of hope for aerospace contractors (sensors, systems, etc) from the possibility of strengthening short-haul, regional flights that will require more narrow-body aircraft, but nothing is yet certain”.

### High-end inertial main segment value: 2019-2025 market forecast

(Source: High-End Inertial Sensors for Defense, Aerospace and Industrial Applications 2020 report, Yole Développement, September 2020)



Indeed, commercial aerospace/civil aviation will take a few years to recover to pre-COVID levels. Between 2019-2025, a -0.4% CAGR<sup>7</sup> is expected for high-end inertial systems associated with this market. On the other hand, UAV, drones, micro/nano-satellites and new space applications (reusable rockets, spacecraft, etc) are expected to grow faster.

The commercial naval market will be negatively affected from COVID-19 in the short term (less cruise ships, less tankers/logistics ships) but in the longer term it is expected to grow at

<sup>4</sup> ASP : average selling prices

<sup>5</sup> IMU : inertial measurement units

<sup>6</sup> INS : inertial navigation system

<sup>7</sup> CAGR: Compound Annual Growth Rate

a CAGR<sub>2019-2025</sub> of 2%, driven by traditional gyrocompass and antenna stabilization. AUV/ ROV could show some promising growth.

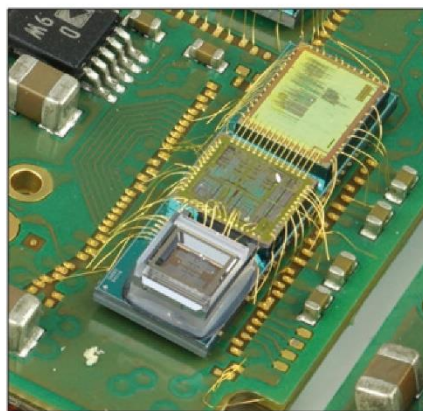
Regarding the industrial market Yole's analysts expect it to drop in 2020 due to the pandemic after-effects, especially due to supply chain problems in general but also due to some drilling applications, since oil & gas projects have been postponed or cancelled. The industrial market will recover in 2021 resuming its growth and is expected to double in size in 5 years, driven by long-awaited applications that we predicted before and have already made their first baby steps: robotic cars, autonomous robots (collaborative, delivery, etc), IIoT<sup>8</sup> and micro/nano-satellites. New players in these domains come from various backgrounds and are ready to adopt inertial technologies. In these high-volume applications, integrators will be probably technology-agnostic and a good cost, size, weight and power (C-SWAP) could prove beneficial. This is definitely a market to watch out for.

The inertial system landscape has been traditionally pretty stable. Both in US and globally, Honeywell is still the leader with Northrop Grumman following. Other notable but smaller players include KVH, Kearfott and Emcore/ SDI. US companies rule over the high-end inertial systems market, with Europe and Asia as runner-ups.

On one hand, the European inertial market is dominated by Safran, which is by far the biggest player, with revenues that are an order of magnitude higher than other players such as Raytheon Anschutz, iXblue, Sensoror, Meggitt, GEM elettronica, iMAR, Kongsberg and Silicon Sensing.. In this dynamic context, System Plus Consulting proposes valuable reverse engineering and costing analyses dedicated on the latest disruptive high-end inertial modules and components developed by these European companies. Its aim is to reveal a deep understanding of the technical choices made by the leading players.

### Sensoror Gyroscope Component – Optical View

(Source : SP20539 - Sensoror STIM318 IMU report, System Plus Consulting, 2020)



<sup>8</sup> IIoT : Industrial Internet of Things

Sensoror STIM318 Inertial Measurement Unit (IMU) report is part of System Plus Consulting collection. The analysts provide today a full reverse costing study focused on Sensoror’s module. This report discloses key insights into technology data, manufacturing cost, estimated selling price and much more:

“STIM318 is the newest IMU proposed by Sensoror” asserts **Sylvain Hallereau, Project Manager at System Plus Consulting**. “It is a tactical grade, non-GPS aided, 9-axis IMU containing three highly accurate MEMS gyroscopes, three single axis accelerometers and two dual-axis accelerometers”.

The company deeply investigated Sensoror’s technical approach and strategy and also analyzed the single axis and dual-axis accelerometers found in this STIM318 IMU. Accurate and strategic results are available in the following reports: Safran Colibrys’s MS1010 and MEMSIC’s MXA2500M High-End Accelerometers. Moreover, a detailed technology comparison between the Safran Colibrys MS1010 and VS1002 accelerometers on one hand, and MEMSIC’s MXA2500M and MXR7250VW accelerometers on the other hand, is included in this report. Finally, a very fragmented market exists in Asia and the rest of the world. The biggest identified players include CASC and JAE.. Chinese developments in inertial technologies originate in either military or academic environments, which are difficult to access. Still, the Chinese market should be closely monitored as many developments are ongoing in the domains of high interest such as structure monitoring in IIoT, and general autonomous mobility.

For **Dimitrios Damianos**: “It is important for the companies involved in the high-end inertial market to invest in the right technologies and partners, depending on the end applications targeted”.

### 2019 high-end inertial players\* and geographic dominance

(Source: High-End Inertial Sensors for Defense, Aerospace and Industrial Applications 2020 report, Yole Développement, September 2020)



All year long, Yole Group of Companies, including System Plus Consulting and Yole Développement, publishes numerous MEMS & Sensors reports. Discover an overview of our activities on i-Micronews.com with interviews with leading companies, analyses from our experts and dedicated online and onsite events. Stay tuned !



## Press Release

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### About the authors

**Dimitrios Damianos, PhD**, joined Yole Développement (Yole) as a Technology and Market Analyst and is working within the Photonics and Sensing division. Dimitrios is daily working with his team to deliver valuable technology & market reports regarding the imaging industry including photonics & sensors. After his research on theoretical and experimental quantum optics and laser light generation, Dimitrios pursued a Ph.D. in optical and electrical characterization of dielectric materials on silicon with applications in photovoltaics and image sensors, as well as SOI for microelectronics at Grenoble's university (France). In addition, Dimitrios holds a MSc degree in Photonics from the University of Patras (Greece). He has also authored and co-authored several scientific papers in international peer-reviewed journals.

**Guillaume Girardin, PhD**, is Director of the Photonics and Sensing Division at Yole Développement, part of Yole Group of Companies. As director he also performs several technical activities covering sensing technologies, including solid-state lighting & display, MEMS, sensors, actuators, imaging, photonics and optoelectronics fields. Based on his valuable experience in the semiconductor industry, Guillaume manages the expansion of the technical and market expertise of his team, by increasing synergies around imaging, lighting and display, and enlarging the optoelectronics scope. The team interacts daily with leading companies allowing the analysts to collect a large amount of data and integrate their understanding of the evolution of the market with technology breakthroughs. In parallel, Guillaume's mission is focused on the management of business relationships with leaders of the industry and the development of market research and strategy consulting activities within the Yole Group. Dr Girardin holds a Ph.D. in Physics and Nanotechnology from the Claude Bernard University Lyon I (Lyon, France) and an M.Sc. in Technology and Innovation Management from EM Lyon School of Business (Lyon, France).

**Amine Allouche** is part of System Plus Consulting's Power Electronics and Compound Semiconductors team. Amine holds a Master's degree focused on Micro and Nanotechnologies for integrated Systems.

**Sylvain Hallereau** has been Project Manager at System Plus Consulting since 2000. He is in charge of costing analyses for Integrated Circuits, Power semiconductors and LEDs. He has significant experience in the modeling of manufacturing costs for electronics components.

**Nicolas Radufe** is in charge of physical analysis at System Plus Consulting. He has a deep knowledge in chemical and physical analyses. He previously worked in microelectronics R&D for CEA/LETI in Grenoble and for STMicroelectronics in Crolles.

**Dr. Youssef El Gmili** has joined System Plus Consulting's team in 2019 after ten years passed on high level research and development on microelectronics.

### About the reports

#### **High End Inertial Sensors for Defense, Aerospace & Industrial Applications – 2020**

*High-end inertial sensors are still the backbone of systems that will enable autonomous transportation and the new space industry despite COVID-19 - Performed by Yole Développement*

#### **Companies cited**

Airbus, Al Cielo, Analog Devices, AOSense, Astrium, Autoflug, Boeing, CASC China Aerospace, Civitanavi, Colibrys, ColdQuanta, Doosan, ElbitSystems(Elop), Elektroprigor, Emcore, Endevco, Epson Toyocom, FiberPro, Fizoptika, Freescale, GEM Elettronica, Gladiator Technologies, Hitachi, Honeywell, IAI, iMAR, Innalabs, iXBlue, JAE, Kearfott, Kongsberg, KVH, L3 Harris, LordMicrostrain, Lumedyne Technologies, MEMSense, Moog/Crossbow, MTMicrosystems, Murata, Navtech, Northrop Grumman, Litef, Optolink, Oshkosh, PCB Piezo, Perm, Physical Logic, Raytheon, Saab, Safran, Si-Ware, SBG Systems, Schlumberger, Sensoror, Sensorex/Meggitt, Silicon Design, Silicon Sensing System, Sensors in Motion, StarNeto, Systron Donner Inertial, Tamagawa,



TDK/Tronics, Teledyne TSS, Teknol, Thales, Tokyo Keiki, UTC Aerospace/AIS Goodrich, VectorNav, Watson Instruments, XSens...

### **Sensoror STIM318 Inertial Measurement Unit (IMU)**

*Newest IMU with 9-axis detection and gyro bias instability of 0.3°/h from Sensoror. – Performed by System Plus Consulting, 2020*

### **Safran Colibrys MS1010 and MEMSIC MXA2500M High-End Accelerometers**

*Detailed technology and cost analysis of the high-end single-axis and dual-axis accelerometers integrated in the STIM318 IMU System Plus Consulting, 2020*

#### **And related reports**

- [Sensors for Robotic Vehicles](#)
- [Status of the MEMS Industry](#)
- [Uncooled Infrared Imagers and Detectors](#)
- [Honeywell HGI120CA50 9-axis MEMS Inertial Sensor](#)
- [Honeywell HG4930CA51 6-Axis MEMS Inertial Sensor](#)

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Founded in 1998, Yole Développement (Yole) has grown to become a group of companies providing marketing, technology and strategy consulting, media and corporate finance services, & technology trends to grow their business... [More](#)

#### **About System Plus Consulting**

System Plus Consulting specializes in the cost analysis of electronics, from semiconductor devices to electronic systems. Created more than 20 years ago, System Plus Consulting has developed a complete range of services, costing tools and reports to deliver in-depth production cost studies and estimate the objective selling price of a product... [More](#)

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