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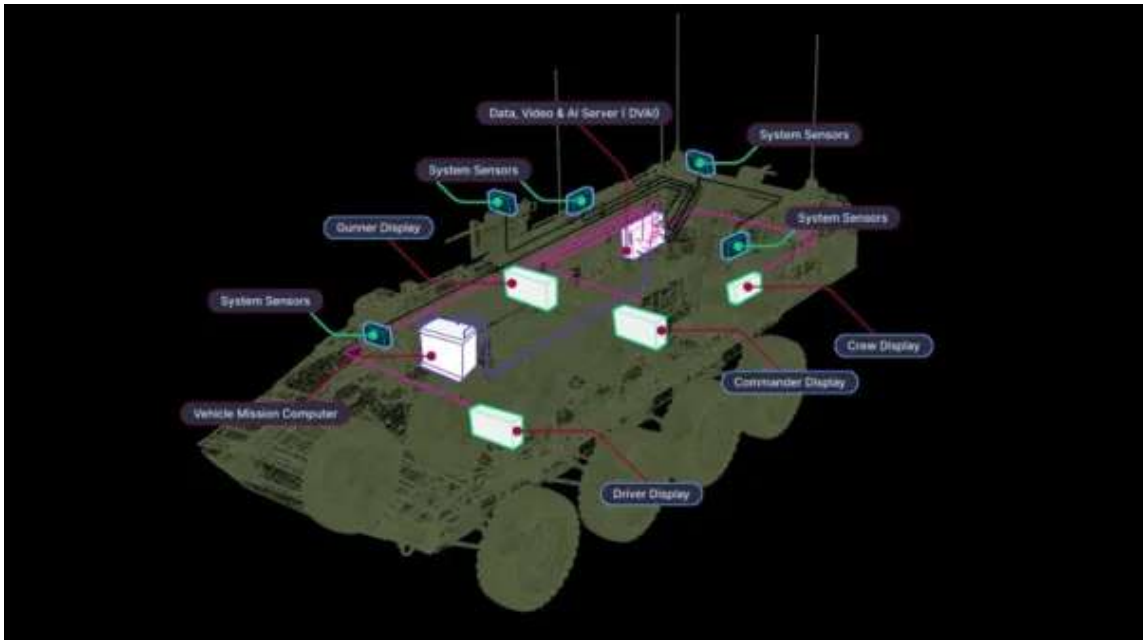
IMCO: Solutions for a complete situational awareness and predictive logistics

CPM Defence Network

The Israeli IMCO Group is an end-to-end solutions partner for advanced platforms and a developer and supplier of subsystem solutions. This applies to land, air and missile defense, and naval applications. The IMCO Group designs, manufactures, and delivers sophisticated electronic and electromechanical solutions and systems – both from existing design documents (build-to-print) and from specifications (build-to-spec) – for mission-critical defense platforms and demanding industrial applications. The company offers turnkey services, including development, testing, serial production, delivery, and long-term logistics support (ILS). The IMCO Group has been in operation since 1974.



IMCO's 360° SAVS Situational Awareness System.
Graphic: IMCO

About three years ago, a restructuring took place; the individual companies, which were managed by a holding company, became one company/group that now works closely together in all areas.

In the USA and Romania, localization of the company's solutions can be carried out, depending on the needs of the American and European markets.

IMCO Group: Focus on land vehicles

The subsystems focus on systems for situational awareness, platform monitoring and control, remote weapon systems (RWS), protection, energy, and driver assistance systems. These systems complete the so-called sensor-to-shooter cycle, from the sensor or operator in the vehicle to the Battle Management System (BMS), thus providing a link to the command level.

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The focus is on protected and armored land vehicles, but solutions are also offered for fighter jets, helicopters, missile and air defense systems, and even smart munitions. Depending on customer requirements, these are available as "built to market" or "built to print" solutions. This includes test and development production, trials, development support, and ultimately, series production.

IMCO's solutions can be found in vehicles such as the Merkava and ARJUN main battle tanks, the US STRIKER and HUNTER combat vehicles, and the Australian Redback IFV. According to the supplier, they are also used in several wheeled howitzers, including the ROEM.

In Europe, we are collaborating with partners such as MTU and Renk on integration – for both the electrical and mechanical components. Currently, new control systems for drives are being developed to make them more efficient throughout their entire life cycle.

IMCO's main systems are SAVS (360° Situational Awareness Video System) and HUMS (Health & Usage Monitoring Systems).

According to the supplier, SAVS has proven its worth in recent Israeli operations. The crew – especially the driver and commander – can drive and operate the vehicle with the hatches closed, while still maintaining complete visibility. This increases crew protection. It also makes it more difficult for the enemy to approach the vehicles undetected in urban or heavily wooded areas, for example, to plant an IED or use an anti-tank weapon at close range.

The crew is always aware of what is happening inside and outside the vehicle. Furthermore, all vehicle protection systems and remotely controlled weapon systems (RCS) are integrated to form a unified system. The platoon leader also maintains a complete overview of all platoon components, even when not leading from the front. HUMS connects the subsystems, of which more and more are being integrated into modern vehicles, without requiring each weapon station or protection system to have its own screen or operating system.

According to IMCO, one of the lessons learned in Gaza is that vehicles without situational awareness systems are quickly vulnerable. There is no longer a front line; danger comes from all directions. Maintaining situational awareness and recognizing and combating threats in a timely manner is vital for survival.

The SAVS 360 system offers AI-powered threat prioritization, improved decision-making for the driver and commander, and seamless integration with the vehicle's active protection and weapon systems.

The core of SAVS is the Data, Video & AI Server (DVAI), to which the Vehicle Mission Computer and all vehicle systems (sensors, anti-drone cameras, RWS cameras, SA cameras, etc.) as well as the monitors/controls for the commander, driver, gunner, and rear fighting compartment are connected. All vehicle subsystems – such as engine & fuel, suspension & transmission, electric power, chassis & hatches, data & video network, and danger control system – are connected via the Vehicle Mission Computer.

Today's vehicles are intelligent, which is why systems like HUMS are necessary. But these systems must not place an additional burden on the crew; on the contrary, they must relieve the crew so they can concentrate on their mission and the fight. Therefore, they must be simple.

Analysis and monitoring of the drive system, as exemplified by all vehicle systems. In case of deviations, the system triggers an alarm and predictive maintenance is initiated.

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The state-of-the-art situational awareness subsystems are designed to increase the operational efficiency, mobility, and survivability of land systems. IMCO offers comprehensive equipment for armored vehicles with real-time 360-degree situational awareness solutions, a measure that significantly improves the effectiveness and safety of troops on the battlefield.

IMCO's holistic system includes hardened cameras, an AI-powered video matrix, a central video hub, and a user interface based on advanced displays.

First, data from all platform systems is collected – using a sensor interface and a high-performance computing module – in order to then decode this information precisely and reliably. The decoded data is made easily accessible to the user via a user interface based on advanced displays; this allows them to control the systems either manually or automatically, as needed. Furthermore, all information is recorded for later analysis and maintenance purposes, ensuring continuous optimization and full control over the systems.

In combination with the modern Health and Usage Monitoring System (HUMS), these systems offer 360° situational awareness and predictive maintenance, which can give European armed forces a decisive advantage in difficult environments.

HUMS, in combination with predictive maintenance capabilities, provides a solution designed to reduce the lifecycle costs of critical systems in armored vehicles while optimizing fleet availability and management. The system continuously collects and analyzes real-time data from onboard platform sensors, performing real-time analyses that enable the triggering of condition-based control commands. These commands help minimize unnecessary downtime, reduce maintenance costs, and extend the service life of critical components.

HUMS is essentially the heart of the vehicle, powered by a centralized data server and mission computer, and offering a wide range of display options. The provider compares it to the Tesla system, where the driver sees and knows everything and can access information about the vehicle's systems, as well as other options – such as their smartphone. And all of this is accessible from inside the vehicle, and according to the provider, it's simple and intuitive.

This means the system is already future-proof, because in the future everything will run via modern touchscreen handhelds, just as it already does on an Airbus A400M.

All these systems have proven their reliability and effectiveness in thousands of combat hours. The data can not only be shared and used within the vehicle or unit, but also integrated into the Battle Management System (BMS). This allows a logistics back office to access and plan with this information. IMCO does not provide the BMS or C4I system; they only handle the integration and input the data/information.

Such solutions are not only possible for new developments but also for older vehicles. This allows vehicles like the Stryker to be retrofitted. For example, a vehicle can be enhanced with a remotely controlled weapon system, loitering ammunition, anti-tank missiles, or a situational awareness system. According to IMCO, the necessary effort and footprint are minimal, so the upgrade can even be integrated directly onto a weapon station/turret.

IMCO is currently developing solutions to expand its power stations and transform them into hybrid solutions. This eliminates the need for the diesel generator to run continuously during operation, saving on maintenance and fuel costs, while also reducing emissions. This makes the system more environmentally friendly and less susceptible to detection. It also streamlines the logistics chain – less diesel consumption and fewer spare parts are required.

HUMS also includes the damage control system, or live support system for the crew inside. From here, the RWS (Rear Warning System) can be operated, and the engine, chassis, transmission, power unit, etc., can be monitored. Monitoring takes place via the data and video server in a very simple and intuitive way, according to the supplier. In extreme cases, this system can directly monitor and control every single tire/tire pressure, shock absorber, and much more.

Since these systems are all so-called software-defined systems, retrofitting and product improvements are quick and easy. Additional functions can be added at any time throughout the product lifecycle without requiring any modifications to the hardware or even the vehicle itself.

Artificial intelligence (AI) plays a crucial role in this process. AI helps the system to quickly deliver information and data to the right place or user. This accelerates the information cycle and the decision-making cycle. It also enables autonomous driving and other fully automated functions, with the driver or commander intervening only in emergencies. AI also assists in the detection and classification of hazards, such as IEDs. Furthermore, AI helps identify and predict problems and manage maintenance cycles. Maintenance is planned and triggered only when necessary, rather than relying solely on paperwork. This aims to extend vehicle lifespans, prevent unnecessary maintenance, reduce costs, and, most importantly, prevent vehicle breakdowns.

Predictive maintenance uses data from subsystems to forecast component wear or failure. This reduces downtime, extends the service life of parts, and lowers costs for emergency repairs or unnecessary part replacements.

By analyzing usage patterns, environmental conditions, and performance indicators, predictive systems can identify problems early and prevent security risks. This is crucial for armed forces operating in complex and contested environments.

analytics platforms, this data can determine the likely failure of a component, identify systems under unusual stress, and indicate the remaining operating time of a platform before the next maintenance. This allows users to shift maintenance from time-based schedules to condition-based decisions. For example, instead of replacing a component every 500 hours, HUMS can accurately indicate when maintenance is required, reducing unnecessary maintenance and saving costs. To facilitate the practical application of this information, HUMS provides users with a specific checklist outlining the steps for resolving equipment issues. These findings are tailored to specific user groups such as commanders, operators and technical teams to ensure that the information is actionable and relevant to action.

HUMS doesn't operate in isolation; it's an integral part of the vehicle's overall design. All embedded sensors must transmit their real-time data robustly and precisely. AI and machine learning platforms process the sensor data and generate actionable alerts. High-speed communication systems then distribute these alerts to the relevant drivers and maintenance stations.

When all these elements work together, predictive maintenance can become a crucial operational advantage. HUMS detects the problem, AI predicts the time of failure, and networked systems ensure that the right spare parts are available in time.

The black box stores all recordings for the mission video recording. These can later be used for analysis.
Graphic: IMCO

Further subsystems

In addition to SAVS and HUMS, IMCO also develops and manufactures specified complete solutions for protection systems or remotely controlled weapon stations for combat vehicles to ensure their protection against new threats.

As mentioned above, energy systems play a crucial role in ensuring the mobility, functionality, and effectiveness of military vehicles. These systems are meticulously designed to provide the necessary electrical power for the platform's diverse components and subsystems—including electronic systems, communication systems, lighting, sensors, and weapon systems. Key subsystems include power transmission junctions, intelligent energy management terminals, power control units, and electronic fuse boxes.

Driver assistance solutions enhance the mobility and maneuverability of vehicles in combat environments. Equipped with day/night cameras at the front and rear, the system ensures optimal visibility under all conditions. The driver display and user interface provide seamless access to critical information. Furthermore, real-time video overlays and other intervention functions enable drivers to make rapid, informed decisions, thereby increasing safety and operational efficiency.

IMCO claims it can develop suitable solutions for a vehicle within four to six months.

Text: Editorial staff / af

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