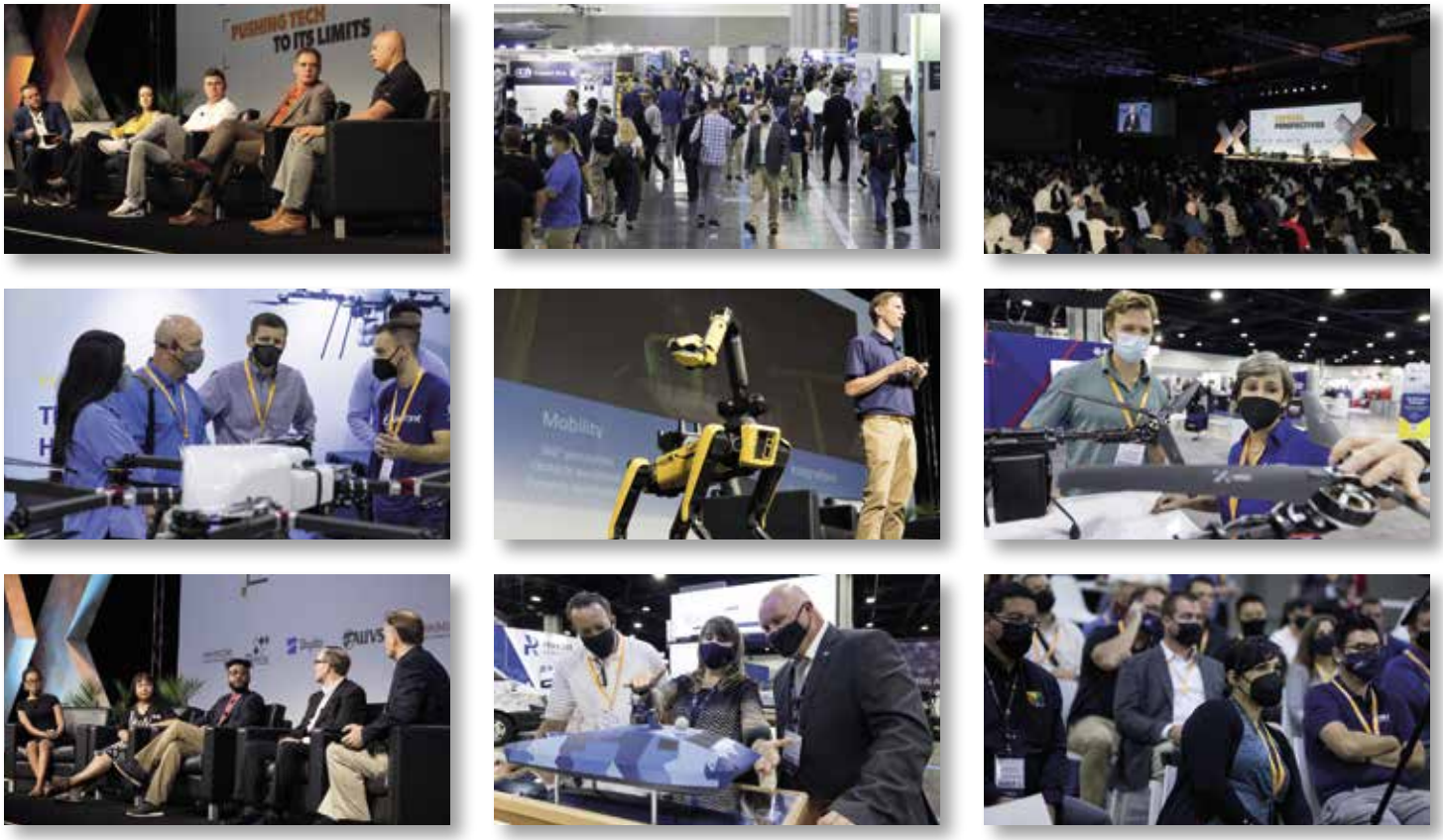


The AUVSI Xponential live exhibition finally returned in August 2021, with hundreds of exhibitors congregating in the Georgia World Congress Center, in Atlanta, to unveil the fruits of their r&d over the past 18 months

One more step towards normality

The easing of some pandemic lockdowns meant this major show could be held as an in-person event this year, spurring a host of companies to show off their wares. **Rory Jackson** reports

After 18 months of postponements brought on by quarantines and travel restrictions, AUVSI Xponential finally returned as a live event this year. Held in the US, in Atlanta, from August 16 to 19, hundreds of companies showcased their latest systems, putting a wave of never-before-seen technological solutions on display.

UAvionix unveiled SkyLine, a cloud-based network for BVLOS management of UAVs and autonomous air taxis.

The company recently received FAA approval to test its SkyLink C-band radios for command and control over the SkyLine network. The radios use an aviation-protected RF spectrum and enable UAS operators performing high-risk tasks to guard against many forms of interference and tampering on the frequency band.

Christian Ramsey commented, "SkyLine consists of uAvionix's certifiable C2 radio hardware currently known as MicroLink, our 2X2 MIMO airborne radio, and SkyStation 2, our networkable ground radio station, along with a tightly integrated service layer.

"SkyLine's network service layer, which is hosted in the cloud, autonomously manages and oversees an entire network

UAvionix now has FAA approval for testing its SkyLink C-band radios

The single-cylinder SP-55 FI TS hybrid engine from Sky Power

infrastructure of multiple ground and airborne radios. Based on numerous mission conditions including link quality, flight plan and the needs of other aircraft sharing the network, SkyLine seamlessly transitions the aircraft's data link between ground radio stations without data loss and with virtually limitless range."

SkyLine has already had its first deployment at the Northern Plains UAS Test Site in North Dakota, in partnership with Thales for the Vantis project (North Dakota's state-wide BVLOS network).

UAvionix is now poised to deploy SkyLine in at least six more FAA-designated UAS test sites. These include the New Mexico State University Physical Science Laboratory Flight Test Centre, the Choctaw Nation Beyond UAS test site in Oklahoma, the ACUASI Pan-Pacific UAS Test Range Complex in Alaska, and the Tillamook UAS Test Range in Oregon (operated by Near Space Corporation). More deployments are to be announced in the months ahead.

On the radios' hardware, Ramsey added, "C-band radios will be critical to heavier and riskier BVLOS operations by moving essential command and control infrastructure to an 'aviation-protected spectrum'. We'll eventually transition all SkyLine infrastructure to C-band, to ensure operators can use the most secure network for supporting their mission safety cases."

Sky Power spoke with us about its SP-55 FI TS hybrid engine, which the company said is increasingly being used for aircraft running solely on electric power and propulsion across a range of applications.

"The single-cylinder engine of the SP-55 series is designed with twin spark plugs, and is equipped with an electronic fuel injection system," said Karsten Schudt.

"With our ECU and SGC352 controller for the starter/generator, as well as integrated mechanical self-cooling, this set-up is load-controlled and can supply power of up to 2 kW [40 A] from a 48 V DC supply."

The two-stroke hybrid is controlled via CAN bus, and comes with a battery and BMS that can be programmed for managing the charge current as well as overload derating and other features.

The ECU meanwhile monitors various electric performance metrics in real time, including generator current and external load current, alongside conventional parameters such as engine temperature. It can therefore perform autonomous throttle regulation and engine starting sequences.

Doodle Labs attended the show to release two new additions to its Smart Radio product line, the Smart Radio Helix and the Smart Radio Wearable. The latter was demonstrated in the conference hall (in collaboration with iSensys), by using it to send commands to a hybrid-electric USV and to downlink its video stream, both over the 3.5 GHz network in the exhibition hall.

"Doodle Labs developed the 25 g Smart Radio Helix to provide an

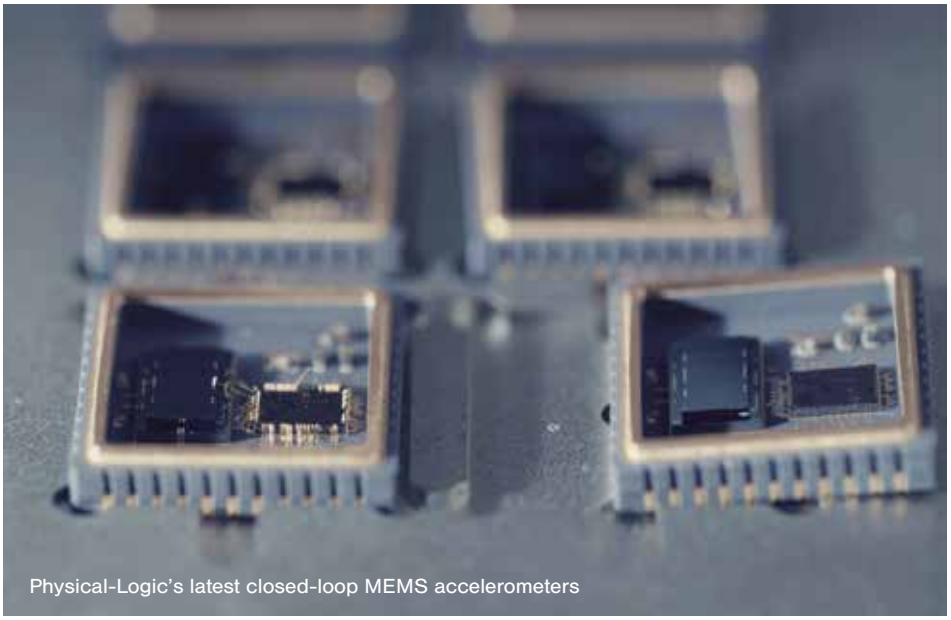
ultra-reliable, encrypted, high-throughput and highly SWaP-optimised mesh data link," said Amol Parikh.

"It operates at six frequency bands, from 1625 to 2500 MHz [which are also known as the M1 to M6 Federal Bands], providing global coverage in a single radio. Helix was developed for the Blue sUAS programme, which was sponsored by the Defense Innovation Unit of the US Department of Defense."

The dual-band Smart Radio Wearable was developed to help connect human operators and handheld GCS devices to private mesh networks. The system comes with a built-in wi-fi hotspot to simplify connecting tablets and smartphones to networks of unmanned vehicles over the internet.

"It has integrated antennas, although it can also accept high-gain antennas, and it can also accept any power source, such as a portable battery bank," Parikh added. "That, and the wi-fi hotspot, free the tablet from having to physically connect to this smartphone-sized radio, reducing weight and cord management.

"We are working with some customers on some interesting applications for both of the radios. For example, one is multi-casting a UAV's video stream to numerous interested parties who are spread out at different distances from the operator, using a combination of the Wearable and a smartphone."



Physical-Logic's latest closed-loop MEMS accelerometers

Physical-Logic unveiled its new 50 g MAXL-CL-3050 and 70 g MAXL-CL-3070 closed-loop MEMS accelerometers, part of its new family of MAXL-CL-3000 products. The company says they are the only available MEMS systems with comparable performance to electromechanical (force rebalance) accelerometers while retaining the former type's SWaP-C grades.

"The MAXL-CL-3000 family's performance characteristics include one year of bias repeatability of less than 0.5 m*g* – with less than 0.25 m*g* in typical operations – and a temperature residual error below 70 μ*g*, Aviram Feingold explained.

"On top of that, we can achieve a vibration rectification error below 25 μ*g*/√Hz, with typical results within 10 μ*g*/√Hz, and a scale factor linearity error below 300 ppm with standard results below 100 ppm."

Charges in accelerometers' Si/SiO_2 interfaces and SiO_2 layers typically affect the sensors' performance after being switched on and under various environmental conditions.

Also, temperature variations, ageing and previous circuit conditions can affect the magnitude of charge build-up in MEMS accelerometers, while high feedback voltages can increase charge build-up and result in high scale-factor and bias errors.

Physical-Logic therefore sought to eliminate measurement errors in the sensor by minimising charging effects on the MEMS device's surfaces and interfaces between the device layers. In 2019, the company began work on minimising the charge accumulation occurring on the devices' interfaces, with an eye towards making the device surfaces as smooth as possible and reducing native growth of SiO_2 layers.

In parallel, the r&d team introduced a new charge release algorithm module for the sensors' electronics. This provides a varying voltage that helps eliminate charge build-ups on the capacitors and other MEMS electrode surfaces.

To make the MAXL-CL-3050 and 3070 production-ready, the company took a number of validation steps. These included analysing performance data accumulated on upwards of 100 prototype MAXL-CL-3000s, and accelerated lifetime testing including a year of storage at 60 C to simulate 11 years of storage at room temperature, with temperature cycles from -40 C to +85 C performed once a month.

UAV Factory has released the Penguin C VTOL, a UAV based on the design of the Penguin C Mk 2 but with the addition of the company's patented Aeroflow VTOL boom technology in the airframe.

The Aeroflow technology consists of servo-actuated hoods that automatically and fully enclose the vertical lifting propellers while the vehicle is in horizontal flight. This effectively eliminates the parasitic drag that such propellers typically impart on such vehicles.

"Aeroflow enables a 20% increase in flight endurance compared with typical twin-boom VTOL-transitioning UAVs," explained Konstantins Popiks. "That means the Penguin C VTOL

Autonodyne's software manages numerous UAVs using automated behaviour profiles

has a standard endurance of 14 hours, potentially more depending on payload.

"Testing has validated that the aircraft is capable of routine take-offs and landings in winds up to 30 knots [15 m/s], which is very high for VTOL craft.

"Another characteristic is that the Penguin C VTOL uses the Mk2's rotating, quick-swappable payload nose compartment. This enables payloads to have additional mechanical gyro stabilisation in the roll axis."

The Penguin C VTOL will soon enter serial production phase, with the first deliveries planned to start at the end of this year and into early 2022.

Autonomy software company

Autonodyne discussed the latest trials and capabilities of its AI solutions, which are programmed for managing large numbers of unmanned vehicles through automated behaviour profiles – effectively pre-planned operating modes with sets of algorithmic manoeuvres or responses.

"We first started tailoring this software for unmanned vehicles after a US Department of Defense operator asked to see if we could get a high-speed jet-powered target drone to fly autonomously, with the intelligence and dynamics of a human steering it with a joystick," said Steve Jacobson. "We installed our software on the drone, streamed the performance data back to a ground station, and the customer was very satisfied with the result.

"One of the funded programs we're now participating in here in the US is aimed at creating 'Monte Carlo' simulations for defence UAVs – essentially inserting highly randomised anomalies into the mission paths of UAVs running our software, to see what adjustments to its mission plans the software decides to have each UAV execute. That's now showing and testing our software's ability to learn over time what works and what doesn't."

Autonodyne's control software can be run on a wide range of GCSs, unmanned vehicles or cloud systems. Data links can transmit command outputs to the radios and hence autopilots of smaller vehicles that lack the computer processors or storage space to run it directly.

Jacobson added. "We can now control decentralised autonomous swarms, where the UAVs do all the mission planning, formations and adjustments among themselves. That frees up the GCS operator, putting them on the loop rather than in the loop."

Anemometer manufacturer

Anemoment unveiled its most advanced 3D sonic anemometer, the TriSonica Sphere wind flux sensor. The new system has been engineered to deliver more precise vertical wind measurements than are typically available, combined with fast sampling rates (up to 50 Hz).

Anemoment's TriSonica Sphere sensor

"Our TriSonica Sphere is the only 3D sonic anemometer engineered specifically for flux and turbulence research that is SWaP-optimised for UAS use," said Liz Osborn.

The TriSonica Sphere features a patent-pending spherical architecture that dramatically reduces the effects of wind shadowing, and increases the accuracy of vertical wind measurements. These qualities are essential for accurately measuring atmospheric turbulence and flux measurements, including eddy covariance studies.

The sensor has an all-aluminium construction, and its design features an open path geometry that enables it

to accurately capture measurements of all three dimensions of airflow with the least possible distortion of the wind field, especially vertical turbulence.

Osborn added, "The sensor was developed in conjunction with BlueHalo, a leading provider of advanced engineering solutions and technology to the national security community."

BlueHalo is also the manufacturer of the WP-V3 ACP Atmospheric Characterization Payload UAS sensor suite that the TriSonica Sphere fits on top of. Packaged together, the solution provides a complete, customisable meteorological sensor suite for making low-Earth atmospheric measurements from various UAS platforms.

Anemoment expects to begin supplying the TriSonica Sphere towards the end of this year.

Dynamic torque switching from ePropelled

EPropelled discussed its latest power generation and propulsion systems for UAVs, as well as other aviation applications such as eVTOLs and manned and autonomous aircraft, along with some of the key technologies behind their design and operation.

"The ePropelled UAV product line consists of starter/generators, intelligent power systems and DC-DC converters, as well as electronic engine starters that operate with IC-engined UAVs," said Nabeel Shirazee. "We also make electric propulsion motors and motor controllers for eVTOLs and full electric and hybrid eSTOL aircraft."

The company's intelligent air motor controllers (iAMCs) are capable of peak efficiencies of up to 99%. Four models are currently available – the 1.9-2.5 kW iAMC100, the 4.1-8.25 kW iAMC300, the 9.7-19.4 kW iAMC900, and the 14.4-28.85 kW iAMC1200 (all at 48 VDC at the lower end and 72 VDC at the top end).

The iAMCs are designed to operate with ePropelled's UAV propulsion motors, which feature patent-pending designs that have been optimised for greater sensitivity to active air cooling. This contributes to a 98% peak power efficiency, as well as improved performance in thinner air, where heat dissipation becomes challenging.

Their stators are wound with copper-clad aluminium wire for an enhanced weight-to-power ratio (as opposed to conventional copper), while sectioned parallel litz windings provide fire breaks and therefore fault tolerance for high-end mission-critical uses.

The company's UAV electric power and propulsion systems can also now feature a patent-pending cast cooling jacket for enhanced thermal efficiency as well as reliability, the technology for which has been implemented in a 50 kW starter/generator for an automotive range extender.

EPropelled also discussed its Hybrid Ready line of high-power hybridised UAV propulsion solutions, which includes starter/generators with up to 14 kW of output power that can produce sufficient torque for starting heavy combustion engines. The systems have also been designed to be capable of starting an engine and generating power for the battery simultaneously.

Lastly, the company's patented eDTS (electric/efficient dynamic torque switching) technology is now available for use in automotive applications. It allows an electric motor to provide high torque at low speeds without drawing high current from the batteries. It also provides high speeds at low torque levels without using deep field weakening and at much reduced winding losses.

UXV Technologies showcased its newest and lowest-cost GCS yet, the Navigator Tab3. It is effectively an add-on, typically installed on the Samsung Galaxy Tab Active3 tablet, to enable tactile joystick- and button-based control of unmanned vehicles.

"There is a growing trend towards BYOD – 'bring your own device' – in terms of GCS system familiarity and interoperability, which is why we decided to offer something around a Samsung system designed for mobile workers that a lot of our customers are used to," explained Steven Friberg.

The Active 3 interfaces with the Navigator Tab3 via a USB interface, with a hinge in the bottom and two spring rods to mechanically secure the tablet in place.

"It also includes our modular NavBay solution, which is designed to allow quick installation or switching between radios from different suppliers, and overall the system costs 75-80% less than any of our other GCSs," Friberg said.

The Navigator Tab3 GCS from UXV Technologies

Overwatch Imaging's Oceanwatch search system in use on a Schiebel S-100

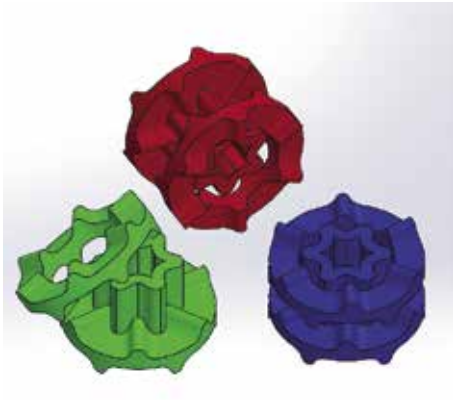
The company has also announced a deal with Auterion to develop GCSs for the US Armed Forces' upcoming Soldier Robotic Controller Program.

The contract principally calls for a handheld and wearable Android-based solution capable of controlling multiple types of UAVs and UGVs. It must also reduce the operator's workload, as well as demonstrating feasible seamless integration with current US Army equipment.

"We've set ourselves a 16-month period to develop the control hardware platform, after which we'll put in a bid to supply 5000-10,000 units for the US Army," Friberg said.

Overwatch Imaging introduced the latest sensor in its series of automated maritime search solutions, the PT-6 Oceanwatch. It is based on the PT-8 Oceanwatch currently used by UASs such as the Schiebel S-100 Camcopter but is notably smaller.

Greg Davis commented, "The PT-6 provides simultaneous EO and IR passive surface search capabilities in form factors suited for Group 2 and 3 UAVs. These provide automated search missions and user notifications of objects in vast areas of open water, for search & rescue missions, maritime domain awareness patrols, freedom-of-navigation operations and maritime interdiction support."



Vibration isolators from Greene Rubber

The PT-6 comes in two main variants, each with its own form factor. One is an externally mounted low-profile longitudinal pod system, the other is a more traditional imaging ball system for integrated or external use. Both weigh less than 2.5 kg (5.5 lb) and have a maximum power consumption of 40 W.

Regarding the form factor variations, Davis said, "Different UAVs have different sensor mounting locations available and different mission objectives, so we adapt our sensor form factor to optimise each aircraft's automated search capability. We also provide an intuitive web-based user interface to minimise integration time for small UAS developers."

The company is now taking orders for the PT-6.

The Greene Rubber Company launched its UAV3004 low-profile vibration isolator at the show. It is the fourth isolator in its UAV product line.

"Our mounts are designed using a combination of in-house software, FEM techniques using material models developed in our chemicals test lab, and our 90 years of experience in moulding rubber," Robert Schleicher said.

He added that controlling vibration aboard UAVs systems is a challenging problem in which a one-size-fits-all approach rarely works. The UAV3004 is therefore designed to isolate lightweight payloads in vibration-prone areas where traditional mounts cannot fit.

Unlike many standard mounts, the

FiberPro's FI 200C and FG 150 fibre-optic gyros

Aerobits' remote UAV identification systems

new isolator mount also has a 'fail-safe' design. This allows the mount to stay captive, even if the elastomer were to fail. Fail-safe mounting is common in large, manned flight systems but notably absent among typical UAS mounts.

"The UAV3004 is available now," Schleicher said. "It offers three stiffness levels, and our applications engineers can help end-users determine and integrate the correct mount for any given air vehicle."

Aerobits discussed its new idME and idME+ systems for enabling remote identification of UAVs. They are designed to comply with the latest F3211-19 regulations on safety-critical surveillance and localisation of autonomous aircraft.

"The regulations stipulate the use of wi-fi or Bluetooth Low Energy [BLE] technology," explained Konrad Cioch. "Our Bluetooth-based devices, unlike other systems out there, can detect the remote ID and position of other UAVs from 3 km away, with typical BLE broadcast of no more than 10 dBm, as specified by RF standards.

"We've put considerable r&d into enhancing the sensitivity of our Bluetooth receiver stations to make that possible. Further work with wi-fi reception and broadcast is planned for the latter part of this year."

The idME unit is designed to interface with Pixhawk-type flight controllers via a JST connector. For full operation, a position source, altitude meter and additional parameters are required so that it can then broadcast to surrounding aircraft and GCSs. The data for these can be obtained directly through the autopilot (and its GNSS-INS) via a MAVLink protocol interface.

The idME+ is largely identical but comes with a multi-GNSS receiver and a barometric altitude sensor. It does not therefore need to interface with the UAV for anything other than power.

Both systems weigh 4 g and measure 31.5 x 15.5 x 7.3 mm. In typical operation, the idME consumes 20 mA and the idME+ 60 mA. FCC and CE certification for both are anticipated in the near future.

Volz Servos spoke with us about its future plans for new servo designs aimed at the fast-growing UAM/AAM (urban air mobility/advanced air mobility) aircraft market, in the wake of the company's recent acquisition of Aircraft Electronic Engineering (AEE).

AEE is an EASA-certified specialist avionics company known for developing, qualifying, certifying, manufacturing and maintaining customer-specific electronics and systems according to a range of critical regulations.

"UAM vehicles require actuators in the 20-100 Nm rated torque range, which is at least three times more than the performance required by most UAVs," said Mark Juhrig.

"Volz, together with AEE, is able to design, manufacture and maintain certifiable actuators that can be shipped with an EASA Form 1-authorised release certificate. Such certifiable actuators are developed according to the RTCA DO-254 requirements for hardware development and RTCA DO-178 standards for embedded software development.

"Also, all product qualification, for both environmental and EMI ruggedness, is done according to RTCA DO-160G."

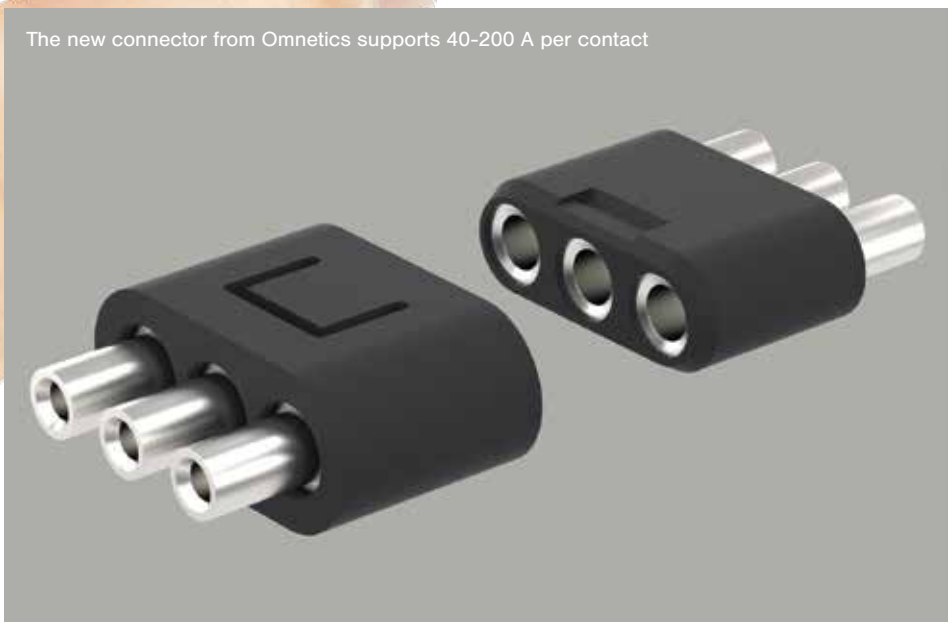
FiberPro attended the expo to showcase two new fibre-optic gyro (FOG)-based products: the FI 200C, a triple-axis IMU, and the FG 150, a single-axis gyroscope. The company's products use the Sagnac effect to measure the velocity, rotation and acceleration of moving objects.

The FI 200C is being introduced as one of the company's lowest price-performance inertial navigation solutions. It weighs 790 g, measures 88.9 x 84.5 mm and consumes 5.5 W at normal operations (peak 8 W) on a 5 V operating power supply.

Its angular rate sensor has an operating range of up to ±490°, a bias stability within 0.5°/hour (in ambient temperatures between -40 C and +70 C), and an angular random walk of no more than 0.025°/√hour. Its accelerometer has an operating range of ±10 *g*, a bias

Sierra-Olympic's Viento-10 IR camera

The new connector from Omnetics supports 40-200 A per contact



repeatability of 2 m*g* and in-run bias stability of 15 μ*g*.

The FG 150 weighs 160 g, measures 60 x 25 mm, and consumes 3.5 W on a 5 V supply. Its measurement range runs up to 1000°/second, has a bias repeatability within 1°/hour (assuming environmental temperatures of -40 C to +71 C), and its angular random walk runs at less than 0.05°/√hour.

Richard Ryu said, "FOG products are starting to replace other technologies such as DTGs and RLGs owing to the relative ease of maintenance and high-performance continuity of FOGs.

"In addition to these two new systems, FiberPro is developing a 0.1° gyrocompass as a navigation sensor for unmanned operation of ships. We expect to begin production of it next year."

Omnetics launched a new connector at the show, which the company has designed for fulfilling a niche highlighted by customers at the previous live AUVSI expo.

As explained to us by the company, "During Xponential 2019, we had a lot of enquiries for a connector that would be lightweight, high density with high reliability and field-terminatable, while supporting more current per contact than our Micro and Nano connector solutions.

"Micro connectors support 3 A per contact, while the Nano connectors each support 1 A. But in 2019, unmanned systems designers were looking for a solution that would support 40-60 A per contact. So we developed this connector to support the 40-60 A per contact requirement."

In the time between the two live events in 2019 and 2021, customer requests increased to 150 A per contact and higher. Based on that feedback Omnetics is now redesigning the product to be configurable and meet this new figure, so the resulting 'Macro series' connectors will be relaunched later this year.

The new scalable connector designs will range from 40 to 200 A, and will feature crimp contacts in two- and three-pin field-terminatable configurations. Solder contacts are also available on request, although Omnetics noted that they could be comparatively harder to terminate and repair in the field. Integrated latches also feature in the design, to keep down the connectors' weight and prevent disconnections during operation.

"The connector is symmetrical to allow it to be flipped if users need to change motor direction," the company said. "Otherwise they can switch two of the contacts, assuming a software-derived solution isn't an option.

"Also, high-voltage applications should be considered on a case-by-case basis, but based on current contact spacing 1000 V should be no problem, and future testing will provide a concrete validation for that number."

Sierra-Olympic Technologies debuted its latest IR camera solution, the Viento-10 USB/GigE long-wave infrared series.

Built around a 640 x 512 resolution uncooled microbolometer camera core, the Viento-10 features a detector array with a 10 μm pixel pitch and is available in USB or Gigabit Ethernet (GigE) interface models.

"10 μm is the smallest pixel pitch LWIR camera on the market," the company said. "It has a 60 Hz frame rate and less than 30 mK sensitivity with 3D noise filters. We also have a growing selection of custom lens options to accompany the camera core, as the new detector enables the use of smaller optics with a narrower FoV over its predecessors."

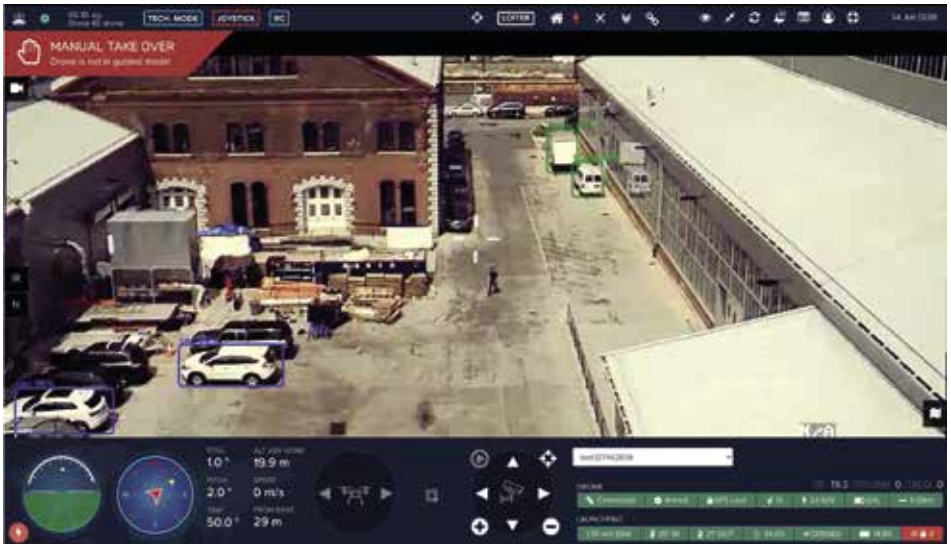
The company worked with

manufacturer Leonardo DRS to develop the detector as a refinement over its predecessor, the 17 µm Tamarisk camera core. The USB 3.0 UVC or GigE Vision 2.0 interface boards included with both systems are designed to simplify connectivity challenges for integrators and end-users.

Sierra-Olympic noted, "The Viento-10 USB can be plugged straight into a USB port and will stream 8-bit digital video within a few seconds. The camera also outputs full dynamic range 16-bit digital video, which can be integrated into most processing platforms or monitored and analysed using USBreeze, the custom software supplied with the camera. In the case of the Viento-10 GigE, users get the same plug-and-play operability via GigE Vision standards."

With standard temporal noise filters applied, Sierra-Olympic validated the Viento-10's performance as being well below the camera core supplier's 50 mK specification, and additional temporal/spatial filtering achieves a noise-equivalent temperature difference of less than 30 mK.

The Viento-10 is SWaP-optimised for integration into particularly lightweight UAVs and UGVs, and the smaller pixel pitch delivers a narrower field of view relative to lens selection. Both versions are ready to ship.



Easy Aerial's ERMS cloud-based GCS enables automatic BVLOS operations for UAS operators

Sagetech unveiled a suite of accessories for its new MX12B DoD AIM Mode 5 IFF transponder, which the company has made available to simplify the integration and operation of the complex Mode 5 system for customers.

The suite consists of an MX12B Benchtop Test Box and Test Box Integration Kit, which contains all the components necessary for laboratory integration, set-up and testing of the MX12B.

Next, an MX12B Aircraft Integration Kit provides the necessary hardware components for installing the transponder into an aircraft. It is available in single- and dual-antenna versions.

A KIV Emulator is also supplied, to enable testing and operation of the Mode 5 transponder system without a KIV-77 or other cryptographic computer, as such cryptography solutions can be challenging to acquire, maintain and control. Additionally, a KIV Tray is provided to simplify the mounting and interfacing of the KIV Emulator or KIV-77 if customers already have one. The KIV Tray also provides ease of removal for the KIV-77.

Lastly, Sagetech's MX12B Mission Control GUI enables integration and operation of the MX12B on a GCS, including the display of smart ADS-B situational awareness information on moving maps.

"The Mission Control GUI not only simplifies the integration of the MX12B system into drone OEMs' aircraft platforms, it can also be deployed directly on the GCS to provide real-time control over the systems' operation," said Tom Furey.

"And by presenting smart ADS-B data – including warnings of potential airborne collision risks – and providing the operator with much greater situational awareness, the GUI creates a solid safety case with regulatory bodies for BVLOS approvals.

"The software can be integrated into a customer's GCS software or used standalone in parallel with their software, giving them multiple options to tailor the system for their own use."

All the suite's components have now entered full production.

Easy Aerial spoke to us about its Easy Remote Monitoring Software (ERMS), a cloud-based GCS software platform designed for enabling mission-critical BVLOS capabilities for UAS operators.

"We originally developed the ERMS to enable remote, automatic BVLOS operations of our drone-in-a-box systems, so we've programmed it with automatic mission planning capabilities, GNSS geo-fencing, comprehensive data logging, and real-time HD and thermal video feeds," said Ivan Stamatovski.

"We also have a wide range of APIs in the software for adding third-party systems, such as UTM solutions for remote ID or ADS-B, other monitoring screens for tracking real-time video surveys, and other alarm software or plug-ins for subsystems or air traffic."

Development of the ERMS included minimising the latency for data over the cloud. The software (via its control station) is designed to directly ping an Easy Aerial UAV – or any other UAV, so long as it uses a point-to-point MAVLink connection – without any third-party software or servers being involved.

We caught up with UAV Propulsion Tech, representing Suter Industries, for an update on the CAE-Suter TOA288 engine (featured in *UST* 32, June/July 2020).

The TOA288 from Suter recently reached a key stage towards FAA certification

The two-stroke 24 bhp engine is now being used in Martin UAV's new V-Bat 128 (*UST* 15, August/September 2017) among other unmanned aircraft, and recently passed the US FAA's Federal Acquisition Regulation 33.49 endurance test run, a key milestone towards certification.

As Bob Schmidt told us, "Suter's facility in Turbenthal [in Switzerland] has a test cell dedicated to UAV engine cycling, in which we can run the engine on a dyno or via a propeller test.

"The testing confirmed the TOA288's maintenance interval hardware change-out, so we only expect to change standard service parts such as spark plugs, air filters and fuel filters prior to an overhaul, and no mechanical hardware will need to be replaced during the interim maintenance."

The TOA288 typically powers Group 3 UAVs, but can use a reduction drive (such as those typically found on manned aircraft) to propel larger aircraft. These solutions use larger propellers at lower revs to increase thrust and reduce noise compared with using a higher horsepower engine to spin a smaller propeller.

Future plans by CAE include the development of water-cooled and heavy-fuel versions of the TOA288.

"NATO has a one-fuel policy that eliminates gasoline use in UAVs for safety reasons, and requires them to run on jet fuel because it has lower volatility," Schmidt explained.

A water-cooled version of the TOA288 is expected to boost power output to 27 bhp without upping specific fuel consumption through improved thermodynamics and therefore more stable internal temperature-holding than in an air-cooled system. It could also be easier to install and use, as a UAV manufacturer would not need to design for cooling airflow during hover stages.

TOA stands for Twin-Opposed Air-cooled so the new water-cooled variant will be TOW, or Twin-Opposed Water-cooled.

Domo Tactical Communications (DTC) showcased its software-defined radio (SDR), the SOL8SDR2x1W-P, which has been designed to provide high-speed, long-range, encrypted data links at a size, weight and power low enough for unmanned platforms.

"The SOL8SDR2x1W-P joins DTC's family of IP mesh and point-to-point COFDM radios," commented Rob Garth. "Based on DTC's SOL8 SDR, the SOL8SDR2x1W-P can operate as a Mobile Adhoc Network [MANET] IP mesh node, a point-to-point COFDM transmitter or a point-to-point receiver to a tablet PC.

"Also, every DTC SDR and NetNode system can host our MeshUltra waveform, enabling commonalty of mesh networking across all deployed radios. MeshUltra was developed for spectrally efficient, high-bandwidth comms in challenging, dynamic, non-line-of-sight environments and BVLOS for airborne ISR platforms."

The MeshUltra waveform can operate at various RF channel bandwidths from 1.25-1.5 MHz, 1.75 MHz, 2.5 MHz and up to 20 MHz. With adaptive modulation up to the 64QAM standard, MeshUltra also supports data rates of up to 87 Mbit/s.

The SOL8SDR2x1W-P typically consumes 10 W during operation and includes native Ethernet, dual USB and serial among its interface options, as well as an audio headset socket.

"DTC has also developed a new MeshUltra-X waveform, offering optimised performance for large networks consisting of up to 144 radios, and operating in channels as narrow as 1.25 MHz, and on a single frequency," Garth added.

"We anticipate that this will meet the needs of large UAV swarms, and other applications where a large number of radios need to operate efficiently in a limited spectrum."