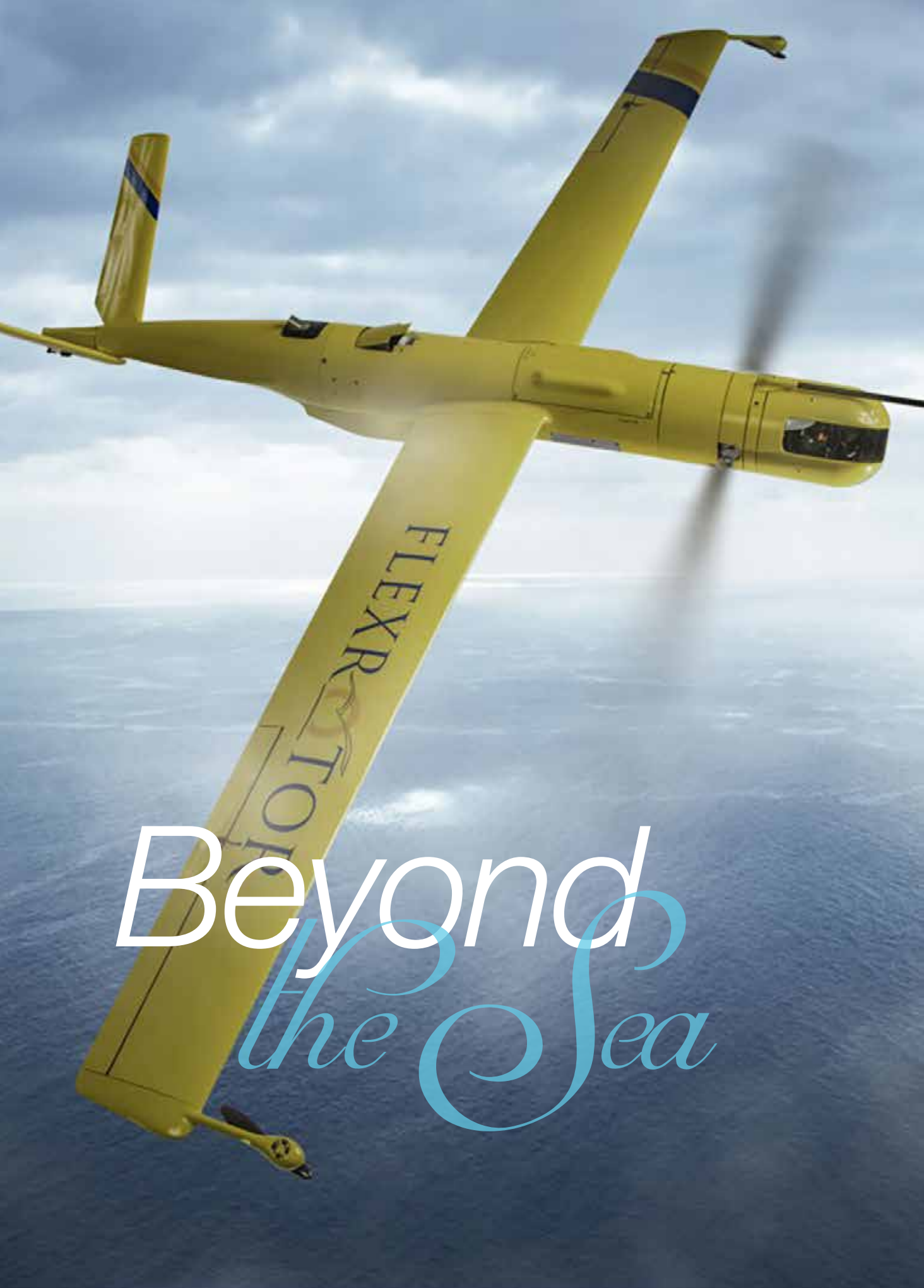

Beyond the Sea

Flexrotor can take off vertically from a skiff before transitioning to fixed-wing flight.

Photo: Aerovel.

Commercial Markets Benefit From Military Investment in Maritime UAS

By Andrew White

Military deployment of unmanned vehicles from surface and subsurface maritime platforms continues to evolve quickly with the more mature navies around the world using unmanned aerial systems, unmanned surface vessels and autonomous underwater vehicles for mission sets ranging from intelligence, surveillance, target acquisition and reconnaissance through to kinetic operations and mine clearance duties.

However, these developments are now being exploited in the commercial domain for a wide variety of tasks covering the energy and environmental monitoring sectors in particular. Such a trend has been triggered by technology improvements encompassing improved launch-and-recovery systems at sea, optimized navigation, increased flight duration and ability to carry heavier payloads.

This innovation in maritime-based unmanned systems falls in line with Grand View Research, which reported on Nov. 7 how the commercial UAS market will be worth more than $2 billion by 2022. The "Commercial UAV Market Analysis" highlighted fixed-wing, rotary-wing, nano and hybrid platforms used for agriculture, energy, government, media and entertainment sectors.

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Currently in development for the Royal Navy and Italian army, AgustaWestland's SW-4 Solo optionally piloted rotary wing UAS (RWUAS) this year completed ground-based tests simulating ship-launched operations with commercial applications also in mind.

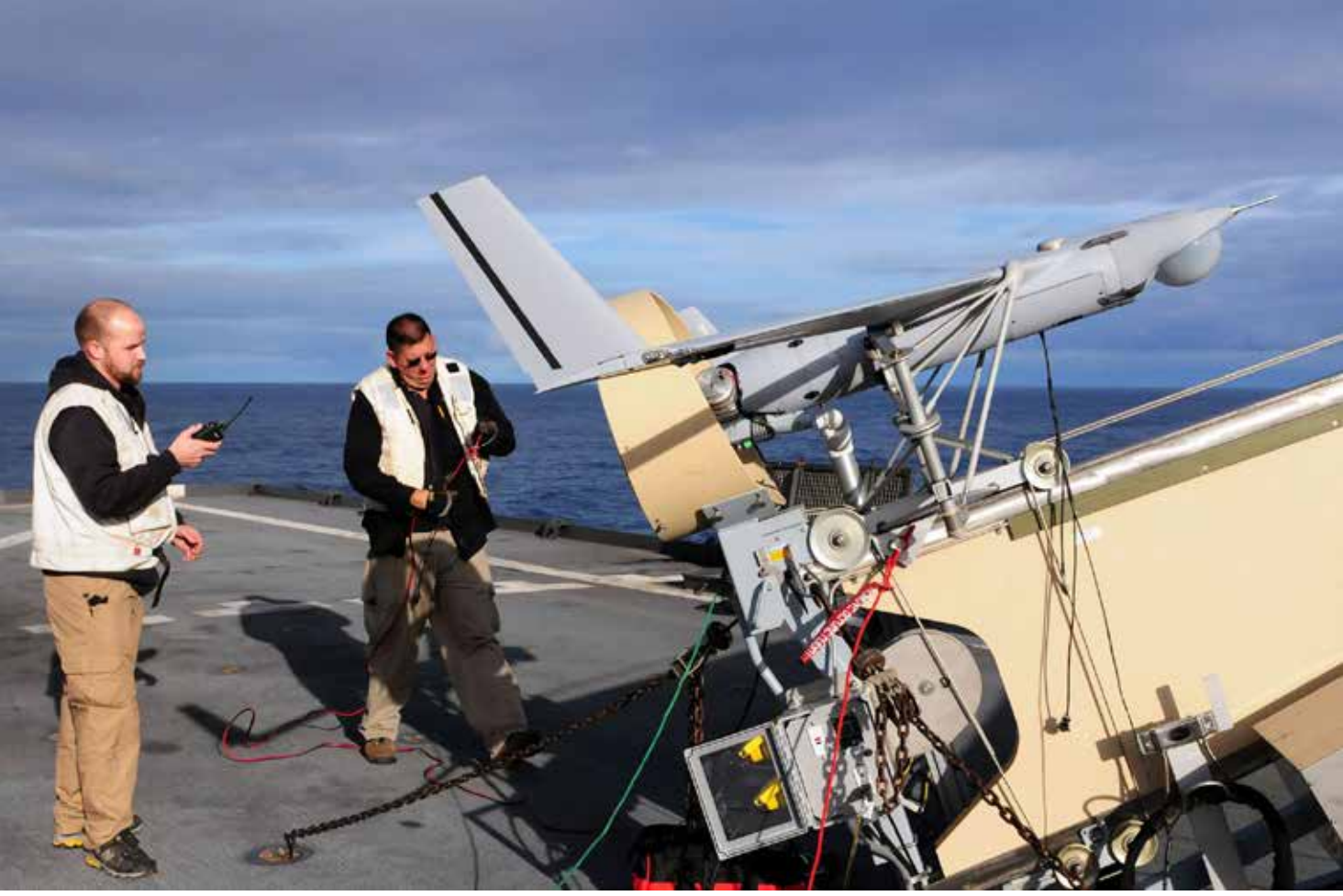
Company sources informed *Unmanned Systems* how the RWUAS could be used for critical national infrastructure protection, resource exploitation, environmental monitoring, humanitarian aid and disaster relief, hydrography, cargo resupply, and communications relay.

"The RWUAS provides a runway-independent operational capability to and from confined and congested areas with no requirement for fixed-wing infrastructure," one source explained while describing how maritime operations could be easily conducted from "helicopter-capable" ships.

In May, simulated deck landing tests, conducted at Llanbedr Airfield, Wales, saw a single SW4 RWUAS execute a total of 22 launch-and-recovery scenarios, as part of a 27-hour flight program. Serials included pitching, rolling and forward-moving simulations of the host landing platform, which was mounted on the back of a truck.

The SW4 platform is capable of launching and recovering from a ship in headwinds up to 40 knots and crosswinds of 25 knots with deck limits ranging from seven degrees in roll and three degrees in pitch. However, the aircraft has no requirement for a specialist launch-and-recovery system while at sea.

With top speed of 111 knots and a maximum endurance of six hours' flight time with a heavy fuel engine, the RWUAS measures 3.3 meters by one meter in folded-wing configuration. It has also proven integration with



Guy McAllister from Insitu, left, and Jason Wolfram from Boeing Inc. perform preflight checks on a ScanEagle before launch aboard the amphibious dock landing ship USS Comstock.

vessel control mission software and comprises a central payload capable of carrying up to 70 kilograms and a nose payload bay which can accommodate up to 20 kilograms. Options include electro-optical/infrared, daylight camera, lidar, radar and communications relay mission modules.

Elsewhere, Aerovel's 20-kilogram Flexrotor vertical takeoff and landing UAS has also proven a capability to be launched and recovered from a vessel. The company first proved the concept in October 2013 when the aircraft was operated from a four-meter skiff which also proved a capability to service the air frame when docked.

Initial tests saw the Flexrotor execute a vertical takeoff and then transition into a fixed-wing configuration before generating images of the skiff and then autonomously recovering back to the platform.

A company spokesperson explained to *Unmanned Systems* how the tests illustrated a "marked advance" in the state of the art in miniature robotic aircraft.

"Flexrotor's autonomy throughout the operations cycle, combined with small footprint, long range, low noise and two-day endurance offer economy sufficient to enable long-promised civil applications at sea and ashore, including geological survey, weather reconnaissance, fishery surveillance, environmental monitoring and offshore patrol."

The aircraft has a maximum endurance of 40 hours and can be quickly assembled from a deployable two-meter storage box. It has a maximum range of 500 nautical miles if operated at maximum speed of 86 knots. Typically, the aircraft, which has a three-meter wingspan when operating in fixed-wing configuration, operates at an altitude of 3,000 feet while being propelled by a 28-cubic-centimeter, two-stroke engine. The platform also has a communications range of approximately 55 nautical miles.

On Nov. 13, the company published details regarding a demonstration for the U.S. Coast Guard, highlighting the air frame's ability to detect boats and small objects over a wide search area of the Chesapeake Bay. This included tracking and inspection of fast boats and the transfer of command and control of the air frame between shore-based command nodes and a 45-foot response boat.

Aerovel described how the asset could be also be operated in swarm configuration from large or small boats, with a company spokesperson explaining how it comprised a low-cost solution compared to helicopters.

"We have shown that Flexrotor can operate from a small boat, but the key remaining question was whether it could effectively spot fish," a spokesperson explained, referring to

environmental monitoring program work. "Now we've done that, with one 'foamer' after another popping up on screen as the turret scanned the middle distance.

"Actually we were looking for a boat. So while search is hard work for anyone — on a helicopter or watching a monitor — we've shown that Flexrotor can get the job done well."

The aircraft has also conducted antipoaching trials around the Costa Rican island of Cocos.

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In the energy sector, there appears to be growing impetus for shipborne operations of UAS in the oil and gas sector with companies including ConocoPhillips and BP considering extension of land-based operations to include maritime and littoral launched sorties.

Contracted to provide monitoring services for ConocoPhillips, Insitu has already proven the capability to launch ScanEagle from maritime platforms in the military domain. However, the company has also launched and controlled the UAS from the Westward Wind research vessel in the Chukchi Sea, approximately 120 miles off the coast of Wainwright, Alaska, in 2013.

A company source informed *Unmanned Systems* how real-time video and telemetry was relayed to a ground control system located on the vessel. Flights to date have lasted approximately 36 minutes each although the second sortie resulted in the ScanEagle experiencing engine failure and ditching into the sea. However, the aircraft was recovered to the vessel.

This particular concept of operation saw the Westward Wind carrying a total of four ScanEagle platforms, which were launched by Insitu's pneumatic catapult launcher and recovered by the company's SkyHook folding boom and catch cable.

"Flight data has been provided to the FAA, academia and the energy industry. The results should help enable future UAS operations in the Arctic by streamlining the approval process for such flights in the national airspace. The use of UAS has the potential to enhance scientific data collection, including monitoring marine mammals and ice floes," the source explained.

"Airborne surveillance is often a component of offshore projects. The UAS could be useful in our monitoring and data collection efforts, with the benefit of improved safety and lower noise levels as compared to using manned aircraft," added Trond-Erik Johansen, president of ConocoPhillips Alaska.

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The Federal Aviation Administration has since reinforced the concept of operation, with officials explaining, "Small UAS in the Arctic can benefit many operations, such as scientific research, search and rescue, fisheries, marine mammal observers, oil and gas leaseholders and maritime route planners. The project is giving the FAA and industry needed experience and a path forward to certify UAS for more commercial operations, both in the Arctic and elsewhere."

Meanwhile, BP and AeroVironment continue to perform flight missions of the Puma AE UAS over land and water in the Prudhoe Bay oil field on Alaska's North Slope. In 2014, the companies signed a contract to provide mapping, geographic information and other commercial services over a five-year period.

The aircraft has yet to be launched or recovered from a vessel. However, a company source at AeroVironment explained to *Unmanned Systems* how the company was "mak-

Photo: U.S. Navy / Mass Communication Specialist 2nd Class Joseph M. Bullavac.

ScanEagle has been used by both the military and ConocoPhillips for ship-based launches. Here, a ScanEagle is recovered on the afloat forward staging base USS Ponce.

Photo: Department of Defense.

ing headway for our Puma system in maritime applications."

A ship-launched solution would see Puma AE equipped with a lidar or EO/IR payload, optimized for processing data into 3-D computer models of roads, pads and pipelines, as well as topographic analysis of gravel pits.

"This is an important achievement for our joint team and for the industry in demonstrating the safe and effective use of our proven UAS technology for commercial applications. Our team has established a model for delivering this flexible and efficient information service, including back-office data processing, to a wide variety of customers and industries throughout the world for whom better information, safety and reliability matter," the company source confirmed.

Operations see the Puma AE flying at altitudes between 200 and 400 feet and at speeds of no more than 40 knots. It has a maximum endurance of 3.5 hours, and in a single application managed to survey 200 miles of road used to support drill rigs transiting across the North Slope.

"The highly accurate lidar-produced maps delivered by AeroVironment's Puma AE, along with precision GPS guidance systems, assist drivers in keeping moving drill rigs centered on the roadways, even in low visibility conditions," it was concluded.

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As military technology continues to evolve in the realm of ship launched unmanned systems, its adaptability and transition into the commercial sector seems assured as a variety of concepts of operation continue to be devised. ■