FROM SKY TO SEA

Will Ashford-Brown *reveals how the UK is powering the future of autonomy*

Artificial intelligence, machine learning and advanced edge computing are no longer emerging technologies, they're part of everyday life. As key enabling technologies have matured, they've facilitated the rise of sophisticated autonomous systems with real-world applications and the potential to transform the way we live and more. Recognising this potential, the UK has positioned itself at the forefront of autonomous systems development. Through significant investment, it has accelerated the development of critical connected and automated mobility (CAM) technologies. At the heart of this is the UK's CAM Testbed, established in 2017,

boasting a comprehensive and coordinated network of six world-leading facilities for the modelling, simulation, testing and trial deployment of connected and automated mobility solutions.

This investment is creating an ecosystem of autonomy that spans land, sea and air – advancing Uncrewed Aerial Vehicles (UAVs), Uncrewed Ground Vehicles (UGVs) and Maritime Autonomous Systems (MAS) in parallel.

HITTING THE MAINSTREAM

Uncrewed Aerial Vehicles (UAVs), or drones, have undergone a 'mainstreaming' effect in recent years, with the market projected to reach $47.16-billion by

The global drone market is projected to reach $47.16-billion by 2032

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2032. Once viewed as futuristic, far-fetched toys, drones are now providing real-world benefits, driving efficiency, reducing costs and improving speed across multiple sectors.

FALLING COSTS

Advances in sensor technology, robotics, accurate positioning solutions and lighter, longer-lasting power systems have collectively reduced both the size and cost of UAVs, fuelling demand across both civilian commercial and defence markets. While there is an overwhelming demand for drone technology from militaries all over the world, they are also offering greater capabilities in policing, surveillance, urban planning, logistics and environmental monitoring. Although mass drone adoption presents a multitude of benefits, such widespread adoption and rapid uptake also pose growing security risks. Drones have disrupted commercial flight operations at some of the UK's busiest airports and raised security concerns, including sightings over US airbases, underscoring the need for robust risk management and regulatory frameworks as the technology continues to mature.

In 2024, the UK introduced the Automated Vehicles (AV) Act, a landmark piece of legislation designed to regulate the use of AVs on public roads and other spaces. According to the Department for Transport (DfT), the AV industry could create up to 38,000 jobs and add £42-billion to the UK economy by 2035. The Act lays the groundwork for driverless cars on UK public roads, which are hoped to enhance overall road safety and reduce accident rates by mitigating for human error, which is currently responsible for approximately 88 percent of road collisions. AVs, falling under the broader category of Uncrewed Ground Vehicles (UGVs), must demonstrate a level of safety equivalent to or exceeding that of a competent human driver. A new approval and licensing system ensures only compliant systems are permitted on public roads. Companies are already responding – Uber, for example, has announced it will trial its AVs with no human safety driver, coined 'robotaxis', in London next spring. Technology is evolving rapidly to meet these standards. High-resolution LIDAR and next-generation sensors will enable more accurate motion prediction, crucial for high-speed, long-range hazard perception and collision avoidance.

MARITIME AUTONOMOUS SYSTEMS

Maritime Autonomous Systems (MAS) are bringing autonomy to the seas, operating on or below the surface without an onboard crew. Valued at an estimated $5-billion currently, the market is projected to triple to approximately $15-billion by 2033. Militaries are leading adoption, employing MAS for a range of purposes, including mine clearance, anti-submarine warfare, intelligence, surveillance and reconnaissance (ISR), as well as logistics support. The UK has taken a leading position in maritime autonomy, with the Royal Navy actively developing and fielding a new generation of autonomous maritime platforms. In July, the UK's Royal Navy accepted three sets of autonomous minesweeping

systems, known as SWEEP, into service, enabling the safe clearance of sea lanes and ability to defeat modern mine threats remotely using uncrewed platforms.

Civil and commercial sectors are beginning to follow suit. MAS are driving innovation in offshore energy, marine science and underwater search and recovery, with autonomous systems

THE UK HAS THE CHANCE TO HELP INFLUENCE INTERNATIONAL LIABILITY AND SAFETY STANDARDS

being increasingly used for oceanographic data collection, uncrewed cargo transport and smart port operations. Like their aerial and ground counterparts, MAS are poised to reshape maritime operations across defence, science, and commerce.

OPPORTUNITY KNOCKS

Opportunities for the autonomous systems industry are anchored in the UK's leadership in key enabling technologies such as AI and space communication technology. Advancements in AI and deep learning, key enablers for hazard perception, will make UAVs, UGVs and MAS more reliable in the complex environments they must navigate. But technology alone won't drive adoption. Public trust and acceptance will be critical. The government, through initiatives like the UK CAM Testbed and the AV Act, alongside private businesses operating in the AV sector, must work together to address public concerns around safety, congestion and job displacement before large-scale uptake becomes a reality.

Regulatory frameworks are also beginning to evolve that are slowly allowing MAS to safely operate in shared waters alongside crewed ships. However, as with all legislative and regulatory constructs, these are not moving at the pace of innovation, presenting a barrier to wider deployment.

SECURE BY DESIGN

With greater technological maturity comes even greater risk. Highly connected platforms present attractive targets for cyber attacks, making security a critical development priority. To mitigate these risks, the future of autonomous systems must be 'secure by design,' necessitating close cross collaboration between the AV industry and the cyber security sector to protect both infrastructure and public trust. While currently the US leads the way, the UK is well placed to work with international partners to shape the autonomous systems landscape, leveraging advancements in AI and space technology. With continued investment, cross collaboration and a focus on safety and building public trust, the UK has the opportunity to not only accelerate civilian adoption of autonomous systems, but also to influence international standards centred around safety, licensing and liability ●