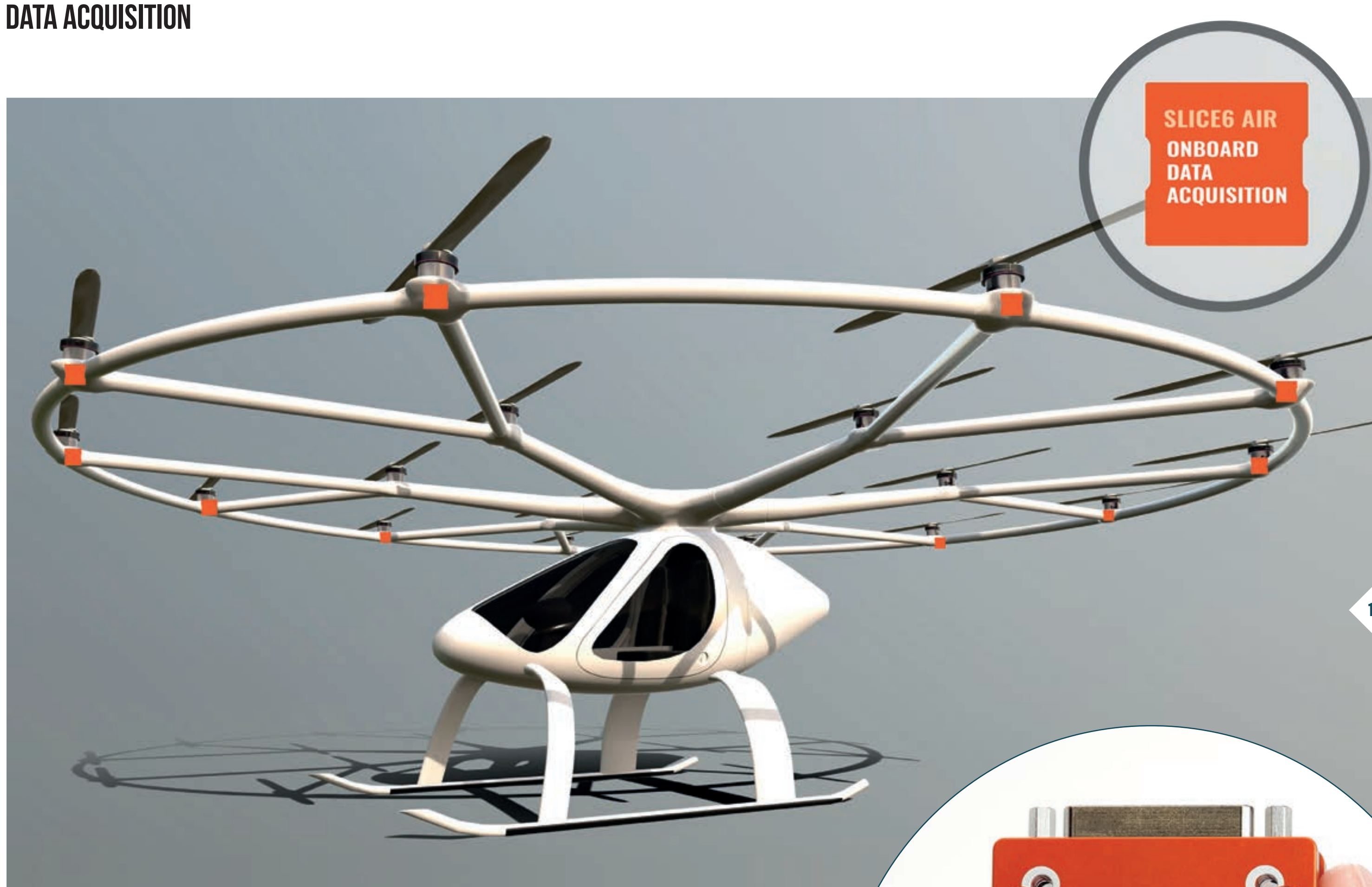

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UP IN THE AIR

Compact and decentralized data acquisition units can simplify and speed up the testing of eVTOL aircraft

// JOHN CHALLEN

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The rise of electric vehicles is not just limited to the road – aerospace is currently undergoing a battery revolution too. Important technologies are under development, along with new test solutions to validate performance and safety.

As eVTOL (electric vertical take-off and landing) aircraft gain traction and show promising commercial viability, the race to market has become a sprint to the sky. For eVTOL aircraft to become the promising solution for urban air mobility (UAM) that many are hoping for, a myriad of hurdles need to be overcome. Currently, structural and performance validation is pushing the latest technology – including test and development tools – while safety regulations are still undergoing evaluation.

Beyond air taxis transporting business and private travelers to a variety of destinations, companies are vying to support UAM business opportunities. The industry is expected to grow from US$11 billion to US$35 billion in 2032, so the opportunities are plenty. Whether it is cargo delivery, medical services, search and rescue, or defense, each business and application requires different design features and functionality.

While development efforts are currently going full-speed ahead, the regulatory framework is still being established. As companies pursue a range of parameters in their designs, everything must be tested and validated, even though exact rules are not yet in place. The agencies officially responsible for oversight or enforcement are also yet to be confirmed.

THE STORY SO FAR

DTS data acquisition systems and loggers have been used by NASA and other agencies for safety testing for decades. But as space travel transitions from well-trained astronauts to a general audience of space adventurers and workers – expectations and assumed levels of safety are increasing.

"As space travel becomes both popular and accessible, the emphasis on reducing the risk to people in both government and private space adventure endeavors is going to go up," says Mike Beckage, chief technical officer and co-founder of DTS. "Risks that people could tolerate during the Apollo era and the space shuttle era are no longer acceptable."

Back on earth – and with safety at the forefront of peoples' minds – the development of eVTOL vehicles has pushed the limits of technology and challenged flight test engineers on how to best test and validate these aircraft. Traditional flight-testing instrumentation (FTI) systems pose numerous challenges for eVTOL aircraft. DTS believes it has a product ideally suitedfor eVTOL development — SLICE6 AIR.

1 // The distributed SLICE6 AIR onboard DAU solution is designed to be positioned near the sensors, reducing test setup time and cost

2 // SLICE6 AIR is a 6-channel networked data acquisition unit with onboard recording and real-time streaming

3 // As eVTOL manufacturers race to be the first to market, testing on the ground and in the air is being pushed to the limit to get critical structural, performance, and safety data

"We have built our entire business around supporting testing applications that are technically challenging," says Beckage. "What makes our solution unique is the size, mass, and the fact that the units get embedded in, or on, the test article. It could be a test manikin, an MRAP, or a rotor. Many times, the test article is destroyed in the test or it ends up in the ocean, which makes it even more critical to get the test data."

EVTOL AIRCRAFT TESTING

DTS developed SLICE6 AIR with a decentralized approach to minimize cable runs and simplify modifications. This provides an up to 50% reduction in sensor cabling requirements. The only cabling that needs to be distributed throughout the aircraft is power, ethernet and potentially a time source. By eliminating the complex cable runs, test setup times are reduced significantly along with the cost. SLICE6 AIR's modular capabilities also mean that extra channels can easily be added to support modification and compatibility testing.

"One of the biggest advantages of the design of the SLICE6 AIR is the ability to decentralize the FTI system and distribute the DAU next to sensor locations," says Beckage. "That's a real game-changer for testing."

Furthermore, the SLICE6 AIR is compatible with existing FTI systems and architecture, enabling seamless integration into existing flight-testing infrastructures, and minimizing the need for costly system replacements.

With its SWaP-optimized design, decentralized approach, reduced setup time and compatibility with existing FTI systems, SLICE6 AIR is an efficient and cost-effective development tool. It simplifies testing processes and improves flexibility for eVTOL flight testing which will change the way humans travel. \\

John Challen is a technology writer for DTS

KEY EVTOL CHALLENGES

Size, weight and power constraints
Traditional flight test DAUs are often bulky and add weight. With many eVTOL focused on optimizing payload capacity, people or products, this extra mass doesn't work well structurally. There is also concern about traditional FTI systems generating excess heat, which in turn, poses reliability and performance challenges.

Complex cable management
Centralized data acquisition systems require extensive cabling, which not only contributes to weight, but also poses challenges for rotary-wing vehicles due to the use of slip rings. These rings can affect data fidelity and increase maintenance and budget. It also does not readily support modification or compatibility testing.

Flight test preparation time
Installing FTI with a centralized DAU can be time-consuming, requiring dismantling of the aircraft to run analog sensor cabling from various points to a central location. This scenario also makes it challenging to support the aggressive flight test schedules in the race to get to market.

Supply chain and custom solutions
Specialized components coupled with supply chain issues can create long lead times. Custom solutions are an alternative, but they typically involve a big price tag.