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CT and Carlos III University of Madrid cooperate in developing AWE systems, a new generation of renewable solutions

- CT and Carlos III University of Madrid make further development in airborne wind energy with the first yo-yo prototype in Spain.
- The teams jointly completed a new real-flight test phase.

Madrid, September 6 2023- CT, a leading engineering company in technological innovation throughout product life-cycles, has been working on **Airborne Wind Energy Systems (AWES)** since 2020. This relatively young technology is emerging as a new form of green energy production using wind as a renewable source of energy.

AWE systems combine multiple concepts to convert wind power in electricity thanks to autonomous aerial vehicles tethered to the ground with a cable. The two main concepts are generating electricity onboard a vehicle (fly-gen) and on the ground (ground-gen).

As part of its activity in this field, **CT has been working in cooperation with a team of AWE systems researchers at UC3M since 2021**. The team is headed up by professors Gonzalo Sánchez Arriaga and David Santos Martín, who are **pioneers in the development of an experimental test bench in Spain for AWE flight systems**, and also in the development of one of the most widely used open code simulators in the sector known as LAKSA, through three projects financed by the State Research Agency.

Among other CT-UC3M joint initiatives are the **industrial PhD programmes sponsored by the Regional Authorities of Madrid**, with the main objective of developing and manufacturing an AWE generation demonstration system, the establishing of the **UC3M-CT Ingenieros university chair** to promote R&D&I projects in this field, and the creation of a **specialised AWES laboratory** in the Leganés Science Park.

The project has just reached a **major milestone**. CT and UC3M have successfully completed a **new test session to compile real flight data**, which will be used to train artificial intelligence models to control the aircraft. The ultimate goal is **to optimise trajectories to achieve robust control whilst also maximising energy generation**. Testing was performed with the help of a **Mobile Test Unit**, jointly developed by the teams, at CT'S AWES flight test area in the Sierra de Gredos mountain range between Madrid and Castilla y León.



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The project is progressing towards its objective of ensuring a **demonstrator targeting the low-cost and self-consumption sector is ready** by spring 2024, which is based on very simple ground-gen type vehicles. The design phase of the electrical subsystem has just kicked-off and the current prototype will be scaled to operate in larger aircraft. The teams intend to present the demonstrator at the **Airborne Wind Energy Conference 2024**, the most important AWE event at world level which will be held in April next year in Madrid organised by UC3M.

According to Agustín Arjonilla, who is responsible for AWE Systems at CT, “this sector requires **diverse, advanced knowledge** in the fields of aeronautical engineering, such as in the conceptual design of aircraft including computing, advanced modelling and simulation, and also in the field of advanced technologies for the **specific generation, storage and distribution of renewable energies**. CT embarked on this project because of our capabilities in all those unique areas within the European aeronautical sector, endorsed by our vast experience in **over 200 renewable energy projects** in Spain and abroad”.

“It is viable technology since there are currently **fully autonomous AWE prototypes** with a power rating in the range of **100 kW**. In fact, they have been proved to be competitive on off-the-grid islands”, explained Prof. Sánchez Arriaga. “It is important to continue researching and developing AWE technologies in order to identify their true potential as today's prototypes become actual products”, added Sánchez Arriaga.

“AWE technology can be used to **compete with or complement conventional onshore wind power, and particularly offshore wind power**. It can even reach the MW range in grid connections, exploiting all the experience and development acquired in the electronic power systems and grid integration in recent decades. It can also substitute the huge unsightly mechanical structures that are currently required to harness wind power through the use of a new system that **optimises the concept of the wind rotor** along with **enhanced control capabilities**”, explained Prof. Santos Martín.

AWES, a scalable, affordable, versatile source of energy

Because of their features, AWES confer savings in terms of **installation times and costs** compared to wind turbines in use today. That, along with the fact that they are **scalable in size and number**, makes them a very versatile source of energy. Furthermore, since they can reach higher layers of the atmosphere than traditional wind turbines, this means they are able to harness energy that is currently unavailable on today's traditional wind farms.

They are **easily transported and deployed** anywhere and provided there is sufficient wind these systems could be the solution to supplying energy in remote areas in case of need and humanitarian emergency.



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In addition to being used to produce energy, AWE systems could also be used as **complementary propulsion systems for ships**, accounting for fuel savings of around 15%.

About CT

CT is a leading technological company that provides innovation and engineering services in the aeronautical, space, naval, automotive, rail, energy and industrial plants sectors. CT pushes the boundaries of technology through innovation, raising performance to new levels throughout the entire life cycle of products, from design, manufacturing to post-sales support. With over 35 years of experience, today CT's success is driven by more than 1,800 talented employees based in nine countries, spanning three continents. www.thectengineeringgroup.com

About Carlos III University of Madrid

Carlos III University of Madrid (UC3M) is a public Spanish university which enjoys well-deserved fame for its work in research, teaching and innovation. It ranks among the best universities in the world in the QS World University Rankings 2024 and among the best universities for the employability of its graduates, according to the latest edition of the Global University Employability Ranking of the Times Higher Education (THE). UC3M is the first university in Europe to obtain the ACEEU dual accreditation for its contribution and impact on the industrial and social fabric, and it also has other accreditations and quality distinctions, such as the EUR-ACE seal in the field of engineering and the AACSB accreditation in business and finance programs.