ADACORSA targets to strengthen the European drone industry and increase public and regulatory acceptance of BVLOS (beyond visual line-of-sight) drones, by demonstrating technologies for safe, reliable and secure drone operation in all situations and flight phases.
The project will drive research and development of components and systems for sensing, telecommunication and data processing along the electronics value-chain. Additionally, drone lead smart industries with high visibility and place for improvement will be developed which will pave the way for a higher public / industry acceptance of the drone technologies.

In particular, ADACORSA will deliver:

a) On the component level, functionally redundant and fail-operational radar and LiDAR sensors as well as 3D cameras. In order to reduce risk, time and costs, the project aims to adapt technologies from the automotive sector to the drone market for these components.
b) On the system level, hardware and software for reliable sensor fusion and data analytics as well as technologies for secure and reliable drone communication using multipath TCP and registration and identification by developing platforms based on eUICCs/eSIM.
c) On architecture level, fail-operational drone control and investigation a pre-operational Flight Information Management System (FIMS) the integration with CoTS components for Unmanned Air Vehicle Traffic Management System (UTM).

Within the project, 35 physical as well as virtual demonstrators of BLVOS, long-range drone flight shall pave the way toward certifiable systems for future integration of drone operations.
ADACORSA's innovations will leverage the expertise of a very strong consortium, comprising world renowned industrial (OEMs, Tier-1. Tier-2 and technology providers) and research partners along the complete aviation, semiconductor and also automotive value chains, providing Europe with a competitive edge in a growing drone and drone technologies market.

The main goal of TTTech Computertechnik in this project was to research into the topic of safety and performance of drone control systems; design optimized avionics interface concepts to support future drone applications with different mixed-criticality data communication. The main step taken was to advance the state-of-the-art solutions and to move from *fail-silent* to *fail-operational capability* of the system to enable more robustness for autonomy in drone flight. As part of the project, TTTech developed Deterministic Ethernet End System IP and the corresponding driver. In addition, TTTech acted as System Integrator to realize a proof-of-concept of a novel drone avionics architecture, together with the industrial partners. The "Fail-operational avionics architecture" laboratory demonstrator (TRL 4) illustrates advanced deterministic networks combining best-in-class automotive and aerospace-grade components as the main building blocks of this solution.

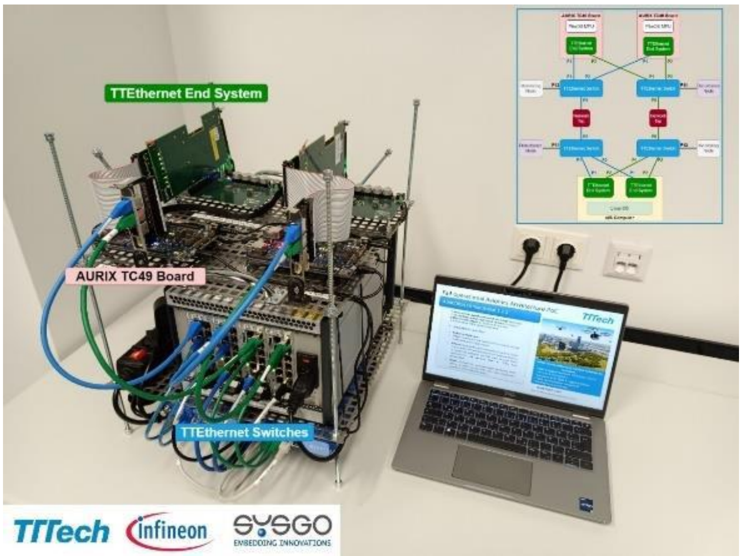


*Figure 1: The ADACORSA final demonstrator laboratory setup at TTTech showcasing drone fail-operational avionics architecture.*

TTTech’s high-speed Deterministic Ethernet backbone is a key element of the demonstrator. It ensures Deterministic Ethernet-based data communication according to a pre-defined schedule with very high reliability, making it suitable for certifiable avionics in aeronautics and space. Infineon’s TÜV-certified automotive AURIX safety microcontroller, extended for multicore processing tasks and equipped with an innovative power management IC, was used to guarantee functional safety up to the highest needs. PikeOS by SYSGO was integrated to support up to DAL A aerospace applications. The company HighTec supported this demonstrator integration providing a compiler for AURIX. More details about the development and integration results can be found here (https://www.youtube.com/watch?v=DAAeb-ODDao).

TTTech has integrated the Proof-of-Concept based on Deterministic Ethernet backbone to realize a fail-operational drone avionics network with redundancy and defined Quality of Service for all data streams. To ensure interoperability, the system uses open communication standards such as e.g., Ethernet or PCIe, and system interfaces can support mixed-criticality data communication (hard real-time also called Time-Triggered, Rate-Constrained, and normal Best Effort Ethernet) over the same wire, which allows to optimize size, weight and power (SWaP) of the overall system.