



Case Study

Simulation and Testing of a Flight Control System with CAN Bus



The Customer

IFSys, a student project in the field of flight mechanics, flight control and aeroelasticity at the Technical University Berlin, is developing an UAS (Unmanned Aerial System), comprising the unmanned aerial vehicle Alexis (Airborne laboratory for experiments on inflight systems) and a corresponding ground station for mission monitoring and control. The project offers students from different research areas the opportunity to take the academic knowledge they have acquired in their studies and put it to practical use.

The Challenge

Implementation of a reliable bus system

The test aircraft is equipped with an automatic flight control system. For registration approval, the flight control system has to be designed such that a security pilot on ground can take control of the actuators at any time. In addition to the control commands from the flight control computer (FCC), the bus system also transmits additional values such as control surface deflection, power consumption, voltage as well as error messages from the actuators. This means the bus system needs to be fast, robust and error-resistant. For development, simulation, analysis and testing of the communication, a tried and tested software tool is needed.

The Solution

Simulating, analyzing and testing the bus communication with a versatile development tool

The actuators communicate with the FCC via a CAN bus. This bus meets the requirements of safety-critical systems. Compared to other bus systems, for example systems based on EIA-485, the CAN bus, with its facilities for bus collision prevention and error detection built into the CAN hardware, is a superior solution. In addition, this bus is highly resistant to electromagnetic disturbances.

For simulations and system testing, CANoe.CANaero proved to be a powerful tool. The CANcaseXL interface hardware provided reliable access to the CAN bus.

The Advantages

Efficient routes to reliable results

For simulations and testing, a test setup (iron bird) was developed that emulates the actual aircraft and incorporates the flight control system. The project team experimented extensively with CANoe.CANaero to confirm the performance and reliability of the flight control system and the CAN bus:

- ▶ Ground tests and flight control simulations were completed successfully.
- ▶ Graphic display of the variables transmitted in the CAN messages facilitates analysis of the system communication.
- ▶ Using CANoe.CANaero, the team was able to shorten the entire development process considerably. This led to a significant reduction in the required personnel and financial resources.

The project is still very interested in collaborating closely with Vector, for example to use the development and test tool CANoe.CANaero to monitor flight control directly on board the aircraft.

