



Over the past 30 years the Astronautical Department at Germany's Aachen University of Applied Sciences (AcUAS) has established valuable contacts with national and international technology partners including universities, space industry companies as well as the European Space Agency. Based on this foundation and its tradition of giving students a research-packed education, the department has embarked on the development of a micro CubeSat satellite, allowing students to gain hands-on experience in the discipline of spacecraft engineering.

“ Altium Designer software makes it possible for students at the Astronautical Department to quickly transform their ideas for innovative spacecraft system solutions into functional hardware pieces. ”

Prof. W. Ley, Aachen University of Applied Sciences

The satellite, named COMPASS-1, is designed to the international CubeSat standard which defines a 10x10x10cm cubic shape with a mass of just one kilogram, where project costs are minimized by the use of commercial off-the-shelf components (COTS). This approach allows the development of very low cost satellites, however the lack of 'space ready' components poses a significant risk to the satellite's survivability. The students counter this by using advanced design tools to develop novel design solutions that offset device anomalies and by extensive use of the university's space testing facilities to verify the craft's functionality.

Key Challenges

By its nature satellite development is a complex and challenging venture, but this is also true for the tiny CubeSats where wide range of disciplines must be mastered, including mechanical, electrical and system engineering plus project management. All of these tasks, as well as the organization of the project itself, are the responsibility of the participating students who also need to master the often complex tools and systems needed for the design process.

While a satellite's complex appearance may imply that the mechanical design is the most time-consuming task, it is in fact the spacecraft internals – the electronic board assemblies and microcontroller software – that require the greatest share of the work. To meet the stringent requirements of CubeSat standard in terms of mass, power consumption, volume and functionality the satellite's internal systems are built from scratch, yet must be able to survive being exposed to the harsh conditions of the spacecraft's final orbit. In order to achieve these goals within the required timeframe the AcUAS engineering team needs to use advanced electronic design techniques while working collaboratively within an efficient project workflow.

Meeting the Challenges

Altium Designer's unified design system allows the students to use a single application to develop circuitry that offers the required functionality, smoothly translate this to a board layout then onto manufacturing output files for prototype creation and final board assembly production. Due to the extremely limited space inside the tiny spacecraft, the complex designs make extensive use of surface-mount devices (SMD) on multilayer boards while the adverse operating environment dictates that the board assemblies must withstand adverse radiation and heat transfer conditions.

Altium Designer allows the students to deal with this level of complexity by offering advanced capture and PCB layout tools in an intuitive, easy-to-use design environment, while the unified design system provides an efficient, collaborative workflow through all stages of the design process – all within a single application. Using the one consistent user-interface, students can also easily implement and push through changes at all levels of the design in response to design revisions instigated by prototype testing results.

The Results

The AcUAS team has successfully moved through the design and prototype development program and on to the production of the satellite's engineering models. The subsequent systems qualification tests determine that the satellite will be ready for space, where the students will then look forward to obtaining a launch opportunity for COMPASS-1.

CUSTOMER SUCCESS STORY



During this process Altium Designer has established itself as a powerful and vital element within the spacecraft design and development program at AcUAS, where students learn to develop high-tech real-world projects using the latest technology and design techniques. Altium and the ongoing Astronautical Department satellite program at AcUAS are helping to create the next generation of space engineers – engineers that are capable of creating more innovative design solutions faster.

About the University

Aachen University of Applied Sciences places strong emphasis on the practical application of science in their teaching and research. AcUAS fosters close cooperation with regional and international companies, renowned research institutes like the Forschungszentrum Jülich (research center Jülich) and universities all over the world. This guarantees students receive an education that meets the increasing demands of today's labour markets.

AcUAS has over 8000 students, more than 220 professors and at least 200 lecturers plus a further 450 staff members at its two locations, Aachen and Jülich. AcUAS was founded in 1971 and ranks among the largest universities of applied sciences in Germany.

ABOUT ALTIUM

Altium Limited (ASX:ALU) creates electronics design software. Altium's unified electronics design environment links all aspects of electronics product design in a single application that is priced as affordable as possible. This enables electronics designers to innovate, harness the latest devices and technologies, manage their projects across broad design 'ecosystems', and create connected, intelligent designs.

Founded in 1985, Altium has offices in San Diego, Sydney, Karlsruhe, Shanghai, Tokyo, Kiev, with value added resellers worldwide. For more information, visit www.altium.com. You can also follow and engage with Altium via [Facebook](#), [Twitter](#) and [YouTube](#).