IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)
On Track: Undergraduate Space Education (3)

Author: Mr. Steffen Reinert
Technische Universität Berlin, Germany

Mr. Tony Erdmann
Technische Universität Berlin, Germany

FROM CLASSROOM TO ORBIT: ENGAGING UNDERGRADUATES IN REAL SATELLITE OPERATIONS

Abstract

As universities launch and operate an increasing number of small satellites, the need for qualified satellite operators is growing. However, undergraduate and graduate students often lack practical opportunities to engage with satellite operations. At Technische Universität Berlin (TU Berlin), we have closed this gap with innovative, project-based courses that offer students direct access to operational, but no longer research-active satellites at TU Berlin. This hands-on approach allows students to gain practical experience in satellite operations while ensuring sustainable utilisation of ageing assets in orbit.

Since its launch in 2019, one of the courses, *SatOps*, has engaged hundreds of students from a variety of academic backgrounds, including aerospace engineering, computer science and electrical engineering, human resources. In addition to first learning about theoretical satellite operation, the participants then learn hands-on how to analyse satellite telemetry, execute commands and maintain software, thereby making an active contribution to the continuing operation of TU Berlin's satellite fleet. Beyond the technical skills acquired, students develop problem-solving skills and experience in interdisciplinary collaboration, which are essential for careers in the space industry. The impact of the course goes beyond the classroom. Aerospace students are exposed to satellite operations early on, which prepares them for advanced degree programmes and professional roles in aerospace engineering. Students who do not come from aerospace backgrounds develop an interest in astronautics and often pursue the subject further. In addition, the programme has led to the creation of *StudOps*, an independent student-led operations group that allows graduating students to take responsibility for satellite operations and develop their own experiments using the existing space infrastructure. This model ensures cross-semester knowledge transfer, established safety procedures, long-term satellite usage and allows students to engage in real space missions.

This presentation will provide insights into course structures, pedagogical approaches, and measurable impacts on student learning and career trajectories. We will share lessons learned, including challenges in sustaining student engagement, methods for assessing educational outcomes, and strategies for scaling up similar initiatives at other institutions. Our findings will contribute to a broader discussion on how to integrate hands-on space education into undergraduate curricula and how to prepare students for the growing demands of the global space sector.