

IAF SPACE EDUCATION AND OUTREACH SYMPOSIUM (E1)  
Lift Off - Secondary Space Education (2)

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FROM CONCEPT TO LAUNCH: SIGNIFICANCE AND CHALLENGES OF DIGITAL ENGINEERING  
IN STUDENT CUBESAT PROJECTS.**Abstract**

On December 3, 2018 a small research satellite, or CubeSat, built by secondary school students from Palm Beach Gardens, Florida lifted off on a Falcon 9 rocket from Vandenberg Air Force Base, and in 2022, this team aims to launch their second mission. These students are able to do this through NASA's CubeSat Launch Initiative (CSLI), a program that offers a rare opportunity for younger students to learn about satellites in a hands-on way. According to NASA, more than 200 students have been involved in the design, development and construction of CubeSats that will be deployed through CSLI. Overall, according to world's largest database of nanosatellites, as of January 1, 2022, 1,663 CubeSats have been launched, with hundreds of them built by university students. CubeSat programs are becoming increasingly popular as they provide students with hands-on introduction to applied space technologies and an opportunity to follow a space project from start to launch.

Designing, building, testing and launching a CubeSat is a lengthy process that involves a series of demanding tasks and requires an interdisciplinary approach. Computer-aided design (CAD) is a very important function during the entire process. From the very beginning, students rely on CAD models to visualize their payload idea and convey it to others. Additionally, CAD modeling is essential in the building process as it allows students to virtually assemble the payload and integrate it into the CubeSat to ensure proper alignment and reduce errors. However, due to limited CAD education available in schools, students struggle even at the university level because CAD skills take time to develop. As result, student teams have to outsource this task to professionals, which is expensive, time consuming and ineffective. When CAD personnel is not an integrated member of the team, it is challenging to communicate the vision and manage expectations, and it eliminates the students' hands-on experience in this important part of the project.

As the world prepares for the next era of space exploration, digital transformations need to take place to provide high quality technical education. Increasing accessibility of design technology education is important for the aerospace industry and its future workforce. This paper will discuss the challenges and investigate effective solutions from the perspective of a CAD student member of the Wolfpack CubeSat Development Team.