Linkedin posts :
this is our biggest achievement so far. Our Bunny designed and built at the EPFL is now proudly orbiting in exosphere.

🚀 The Falcon 9 rocket took off from the Space Launch Complex 4 East at Vandenberg Space Force Base in California on January 31st, 2023 at 8:15 a.m. PT (17:15 CET).

This is Bunny's circuit board. Blank.

This tiny board played a significant role in our space mission earlier this year. As we set out to launch our Bunny into space, we knew that we couldn't have done it without the support of our sponsors. Eurocircuits played a crucial role in the success of our mission.

Their high-quality and reliable circuit board was an integral part of our on-board computer, enabling us to carry out our mission successfully. The board was designed to withstand the harsh conditions of space, ensuring that our on-board computer operated flawlessly throughout the mission. EuroCircuits' contribution to our project has been invaluable, and we are grateful for their support.

The countdown is on ⏱️

In just 7* days, our OBC Bunny will be launching into the great unknown aboard Space X's Falcon 9. 🚀

Our team has been working tirelessly to bring this project to life and the day has arrived.

This is a momentous occasion for the EPFL Spacecraft Team. Our work will finally be showcased to the world.

Get ready to join us on an unforgettable journey as we make our history! 🔥

🤝 This is happening through a partnership with D-Orbit and we would like to thank them warmly to make this happen.

We're so glad to have D-Orbit as our partner to test our components in space. 🤝

Our president Aziz Belkhiria was at the #IAC2022 to reveal the HOBC project in partnership with D-Orbit. Have you met him at the Swiss Pavillon ?

📸 From left : Renato Panesi, CCO at D-Orbit, and Aziz Belkhiria, President of EPFL Spacecraft Team

Press Release:

D-Orbit and EPFL Spacecraft Team Sign Hosted Payload Agreement

The mission will test and validate the HOBC onboard computer developed at the Swiss Institute of Technology – Lausanne (EPFL).

Space logistics and transportation company D-Orbit enters into an agreement with the Spacecraft Team of the Swiss University École Polytechnique Fédérale de Lausanne (EPFL) for the in-orbit

demonstration (IOD) of the HOBC onboard computer developed in-house by the students of the Spacecraft Team.

The IOD mission is part of the CHESS project, which aims at launching a constellation of two CubeSats to analyze the Earth's atmosphere chemical composition and its evolution over time. The satellites will be placed in an elliptical orbit with a low perigee that will allow the spacecraft to "scoop" the higher layers of the atmosphere at the perigee and sample the exosphere at the apogee. The project is also a proof-of-concept for low-cost probes to investigate extraterrestrial atmospheres in future planetary missions.

"We are happy to collaborate with a major academic institution like EPFL," said Renato Panesi, D-Orbit's chief commercial officer (CCO). "As a company, we believe in supporting higher education initiatives. With this mission, we are offering EPFL Spacecraft Team an opportunity to de-risk their project while giving students the excitement and experience of going through a real launch campaign."

The payload will be integrated inside ION Satellite Carrier, D-Orbit's proprietary orbital transfer vehicle, which allows the rapid integration of proprietary and third-party payloads through a standardized plug-and-play mechanical, electrical, and data interface. Testing and validation will be performed on a mid-inclination orbit.

"This project marks an important milestone for our association and EPFL!", said Aziz Belkhiria, President of the Spacecraft Team. "Through this project, our students have the opportunity to experience the full life cycle of a space project, from concept generation to launch, in a short amount of time. We are now aiming at performing multiple IODs for our components and building a flight heritage before the final launch of CHESS."

The EPFL Spacecraft Team aims at stimulating the Swiss space ecosystem with complex educational projects involving university students. Besides training the next generation of space engineer students to conduct innovative space projects, the initiative fosters the creation of stronger links between academy and industry to impact scientific research and the space ecosystem.

The launch is scheduled in Q1 2023.

About EPFL Spacecraft team

The EPFL Spacecraft Team is a student-led association that coordinates the CHESS mission, whose purpose is to launch two scientific CubeSats to analyze the earth's exosphere. The team comprises almost 50 students divided into 13 poles bringing together the various engineering backgrounds from EPFL.

The main goal of the EPFL Spacecraft team is to design the CubeSat platform for the CHESS mission, all while providing the students with a hands-on experience and enabling them to live the entire life-cycle of a space project.

EPFL Spacecraft Team's sequential approach aims to perform the in-orbit demonstration (IOD) of the various subsystems as hosted payloads. Besides the educational value, this method helps build flight heritage and de-risk the CHESS platform. Therefore, the final mission will be based on flight-proven components that house the valuable payloads.

The engineers of the on-board computer succeeded at developing a space-rated computer in less than four months, including testing and integration. It will be launched in early 2023. The team is now targeting a second launch in the coming year for a telecom module.

These accomplishments helped to define the new vision of EPFL Spacecraft Team: Becoming the students' fast track to space

EPFL Article:
On January 31, the EPFL Spacecraft Team's onboard computer Bunny was launched in California, USA, hosted on a D-Orbit spacecraft as part of Starlink's 2-6 mission. This is the first time anything made at EPFL has been launched into space since 2009.

For many, this was just another Starlink launch. For us, this was the return of EPFL to space. A few months ago, we were holding Bunny in our hands, and now it is in orbit. However, the challenge is not over yet. Now we wait for the first contact and hope that our payload survives in the vacuum of space.

Aziz Belkhiria, President of the EPFL Spacecraft Team

Nearly fifteen years after the launch of the SwissCube CubeSat, another piece of EPFL machinery has gone into space: an onboard computer named Bunny, built and designed by the student-run EPFL Spacecraft Team leading the CHESS mission. The aim of the CHESS Mission is to build and launch two CubeSats, miniature satellites in 10x10x30cm cubes, in 2026, and Bunny is a prototype of the onboard computer for that mission.

Initially, the team had been solely focused on that future launch, until Italian aerospace company D-Orbit came to them with an opportunity in April 2022: to fly their computer on an experimental mission inside an ION Satellite Carrier, D-Orbit's orbital transfer vehicle, in January 2023.

"This basically triggered a whole process of trying to rethink our strategy," says Robin Bonny, Vice President of Electronics for the EPFL Spacecraft Team. "At that point, we didn't really know how to go about this process because we weren't that far ahead in the mission. But we always had the onboard computer, the only system that was fully developed by EPFL students at that time. So we thought, let's try to take the design that we have now and get this to fly as soon as possible."

L'assemblage de l'ordinateur de bord dans les laboratoires de l'EPFL © 2023 EPFL

A tight timeline

After D-Orbit presented the opportunity to the Spacecraft Team in April 2022, they had around two months to redo the whole onboard computer in order to have sufficient time to test it and bring it to D-Orbit for integration into their spacecraft by September 2022.

Throughout the summer, the team did full testing procedures. While they understood the computer from an electrical point of view, they also learned how to integrate the electronics they have with something that can actually launch.

“We got this whole list of things that we had to test for and adhere to.” says Bonny. “Then the rest of the summer was just testing, testing, testing.”

They needed to test for the behavior of Bunny in a vacuum under different temperature ranges, which was something they could do at EPFL in collaboration witheSpace and Space Innovation using their vacuum chamber. To show that Bunny would survive launch with all of the accompanying conditions such as acceleration and vibrations, the team brought the computer to the facilities at the University of Bern, where they could shake the structure of the payload and make sure that nothing came loose. Along with testing the hardware, they also had to develop a robust and bug-free software with no framework.

“I joined the EPFL Spacecraft team to see my code sent to space,” says Joaquim Silveira Francolino, a master’s student in robotics and the team’s Vice President for Software. “The pressure was intense. I found myself more stressed about the tests than my own exams, which were scheduled for the same time.”

In September, they went to D-Orbit’s facilities in Italy to integrate their piece of hardware and test it with D-Orbit’s system. The team also learned about the paperwork side of going into space, completing and submitting all the qualifying documentation.

The EPFL SpaceCraft Team in Italy © 2022 EPFL

“Launching something in space is not a simple task,” says Prof. Jean-Paul Kneib, Academic Director of the eSpace Center and Principal Investigator for the CHESS Mission. “It requires a lot of commitment and dedication, so these students have to be proud of their achievement!”

Real world experience

Bunny is a 1 Unit payload weighing 0.8 kg that is flying as a hosted payload on the D-Orbit spacecraft, which was on a rideshare Starlink launch along with multiple other Starlink satellites. The specific orbit where the D-Orbit ION spacecraft has gone is in LEO, to a high inclination orbit that is not very typical or highly used, but good for this trial run.

Payload in an aluminium box © Clément Loyer / EPFL

In a few years, a computer similar to this one will be integrated as part of the EPFL Spacecraft Team’s CHESS Project to construct and launch two 3U CubeSats (10x10x30cm each) into Low Earth Orbit (LEO), the orbit between Earth and 1000km of altitude. Bunny is intended to be the flight computer of the CHESS CubeSat, responsible of controlling and operating the satellite.In this current mission with D-Orbit, the Spacecraft Team is essentially tricking Bunny into thinking it is in a CubeSat and executing commands. So any failure in this mission will not impact the D-Orbit satellite and will serve as feedback to improve the computer’s design.

The future CHESS CubeSats will conduct scientific research such as measuring the chemical composition of Earth's atmosphere. However, this is a long-term project. Already, the team has been working on it for nearly four years and some of the students who worked on it or who are currently working on it won’t witness the launch of the two CubeSats. Meanwhile, the Bunny project was done in just a couple of months, allowing a group of over a dozen students to see it through from

beginning to end, experiencing the real-world experience of building and qualifying something to be launched into space.

“From an educational perspective, it is really interesting to the average student to actually see this process of having something that’s going to fly,” says Bonny.

“Integrating the software with the Bunny on the ION was the most stressful task I faced in my academic life,” says Silveira Francolino. “The consequences of errors would have been catastrophic for the mission, so there was no room for deviation. But despite the pressure, it was a great experience, and I would recommend it to anyone interested in engineering.”

The Bunny mission is also specifically designed to be sustainable, as the ION spacecraft has active deorbiting capabilities that enable it to reduce its altitude and clear the orbit once the mission is complete. Additionally, the satellite is equipped with a drag-sail developed by the German company HPS. This technology ensures that the satellite does not become space debris and pose a threat to other spacecraft, aligning with EPFL's strategy to promote space sustainability.

A future full of launches

“This project marks an important milestone for our association and EPFL”, says Belkhiria.

Going forward, the Spacecraft Team hopes to operate a project similar to Bunny each year, so that all student members go through this process of developing and qualifying something for space on a subsystem level within one year.

“We are now aiming at performing multiple in-orbit demonstrations for our components and building a flight heritage before the final launch of CHESS,” says Belkhiria.

While the 2009 SwissCube was a single CubeSat, CHESS will be two CubeSats, each three times the size of the SwissCube, and will carry high-grade scientific instruments into space for research. Regularly launching their technology on hosted payloads de-risks that final project, so that when the CHESS mission launches, it will be with flight-proven components. This is crucial as it will carry science payloads that cost over CHF 2 million.

“It seems like a logical progression that the SwissCube was more than 10 years and now we are leveraging this heritage and saying that we as a team of students want to demonstrate that we can go up in complexity,” says Bonny.

The MAKE educational initiative:

EPFL SpaceCraft team is one of the interdisciplinary projects supported by EPFL in the framework of the MAKE educational initiative.

MAKE aims to provide students with the necessary resources for the implementation of interdisciplinary projects and to strengthen project-based learning at EPFL through concrete projects that students carry out individually or in teams.

These projects reinforce disciplinary learning through practical application and are conducive to the development of know-how and transversal skills essential both for their academic success and for their entry into professional life.

By being immersed in conditions similar to those encountered in industry and research, students gain autonomy, learn to collaborate and communicate, acquire skills in project management, all the while

mobilizing and applying the knowledge acquired through their overall curriculum, thus complementing and reinforcing their learning outcomes.