A SHORT SUMMARY BY DIEGO ORTEGA ANATOL, 18TH CVA SUMMER SCHOOL PARTICIPANT

The CVA Summer School 2017 was hosted by the ISAE-SUPAERO school in Toulouse during the month of July. The theme of the course was "The future of European Space Transportation Systems: needs, challenges and organisation".

A good mix of students and young engineers from Spain, France, Italy and Germany took part.

At the official opening welcome speeches were given by representatives of ISAE-SUPAERO, the city of Toulouse and CVA. A very impressive key note speech followed by the former ESA Director General, Jean-Jacques Dordain.

Each participant was then assigned to one of the four team projects related to the preliminary design of space launch systems.

Throughout the course we attended a large number of lectures which covered various topics related to space and were taught by professionals.

During the first week the lessons were generally centered on principles of classical mechanics applied to launchers and space propulsion systems. Jerome Anthoine, a researcher at ONERA, the French aeronautics, space and defense research lab, talked about hybrid propulsion; Uwe Apel, professor at the Hochschule Bremen, explained the systems of liquid propulsion; and Géraldine Naja, ESA's Head of Industrial Policy and Audits, gave interesting information about the Agency.

In that week we also attended a conference given by Philippe Perrin, a French astronaut who spoke of his training and experience in space.

Conference of the astronaut Philippe Perrin at ISAE-SUPAERO.

Along with the lessons and visits we were able to carry out activities of a more playful nature. The first week of the course concluded with a workshop of water rockets, small artifacts that allow you to easily see the principles of the operation of launch vehicles. Under the tutelage of Professor Apel, Jerome Anthoine and Grégoire Casalis (professor at ISAE-Supaero and researcher at ONERA), a total of 10 rockets were built and launched, some with more success than others.

Launching of a water rocket.

The lessons in the second week brought new themes: for example the design of micro satellite launchers, aerial launchers and the history of the Vega small launcher programme.

Among the two most notable, one was given by Yves Gourinat, a passionate ISAE-SUPAERO professor who was trained to be a crew member of the Soyuz spacecraft. In his lecture, Yves Gourinat spoke about the history of the space race and the importance of innovation in the future of space exploration.

The other lesson was given by Charlotte Beskow, an ESA engineer who told us about her experience as a manager of the ATV (Automated Transfer Vehicle) programme. With her we learned important lessons about the organisation and development of space programmes.

During the second week we visited Thales-Alenia Space, the largest satellite manufacturer in Europe, where we were able to enter the clean room where satellite components were assembled. Another day we accessed some CNES laboratories.

During the second week, Professors Gourinat and Casalis offered us a flute and organ concert.

There was also a meeting of CVA Summer School Alumni, with whom we visited the Clément Ader Institut, Cité de l'espace and Aeroscopia.

A very interesting visit was to the Clément Ader Institute (ICA), a research center where Professor Gourinat was our guide. Here we visited numerous laboratories and test machines, and we could also observe a supercomputer used for simulations.

Professor Yves Gourinat shows the facilities of the Institute Clément Ader.

The "Cité de l'espace" is an open-air museum dedicated to space, which features an almost real-scale model of the Ariane 5 launcher and another of the Russian space station MIR, as well as satellites, etc. We were accompanied by Professor Gourinat, our much appreciated guide, who provided us with lots of information and curiosities.

The Aeroscopia is a museum dedicated to aviation, which has a large number of aircraft of all sizes, configurations and ages: planes, fighter planes, civil and military transport planes, and two Concorde.

Participants of the CVA summer school at the Cité de l'espace, with a model of the Ariane 5 launcher.

The first two weeks of Summer School were memorable, intense and full of great experiences.

During the last two weeks of the Summer School the number of lessons were reduced as the team work started. Lessons in the mornings, dealing with topics such as future models of launchers, subsystems that make up the satellites or the activities of the company Telespazio.

Two of these lessons deserve special mention. Carsten Wiedemann of the Technical University of Brunswick (TU Braunschweig) gave an interesting lecture about space debris in which he showed the various catalogues and models that exist about these dangerous objects. Juan De Dalmau, ESA Head of ESTEC & ECSAT Communication Office and also representing ESA in the CVA, spoke on risk and crisis management, with special emphasis on the need to adequately carry out press releases and press conferences; we even applied these concepts in a case study, in which we learned various communication techniques.

Two visits to companies and research centers took place during the third week. At Airbus Defense & Space we were able to briefly observe a clean room, where several satellites were assembled.

At ONERA, Professor Casalis and Jerome Anthoine (both researchers of the center) guided us and we saw several test benches of rocket engines. There, three lucky Summer School students had the opportunity to witness an engine test, while the rest of us unfortunately had to watch a failed live broadcast…

During this week we attended a reception at the City Hall of Toulouse Capitole, as well as the event C'Space Day, an international student micro rocket launching competition held in the Ger military camp (near the cities of Tarbes and Lourdes

Estela left by a rocket in the event C'Space Day

My team project, we were eights students in total, was focused on the preliminary design of a reusable stage of a launch vehicle. After the Space Shuttle era, the use of reusable launchers is again studied and tested, due to the lower costs these systems are supposed to imply.

The development of these vehicles is spearheaded by private sector companies such as SpaceX or Blue Origin, which design take-off launchers and vertical landings. The space agencies also work on their own designs.

Vertical landing of Falcon launcher 9.
Source: SpaceX.

Our work consisted of the calculation and estimation of various parameters related to the trajectory, mass and stabilization, control and landing systems of a small scale demonstrator. The mission of this demonstrator, about 50 kg (without propellant), would reach a height of 5 km, and after a descent phase it should land vertically. The project was framed within the PERSEUS program, led by members of the French space agency (CNES).

Team members worked hard, especially during the last week, but due to the limited time available, lack of experience in projects of this type and lack of supervision, the results we obtained were not very detailed.

On the last day of the course we had to present these results in front of a Jury, made up of members of universities, companies and research centers associated with CVA. Each team (four in total) presented the project they had developed, while the Jury asked questions and comments.

After the presentations, the closing ceremony took place. Professor Gourinat gave a final speech about the past and future of the space adventure, emphasizing the influence of art and literature in this area.

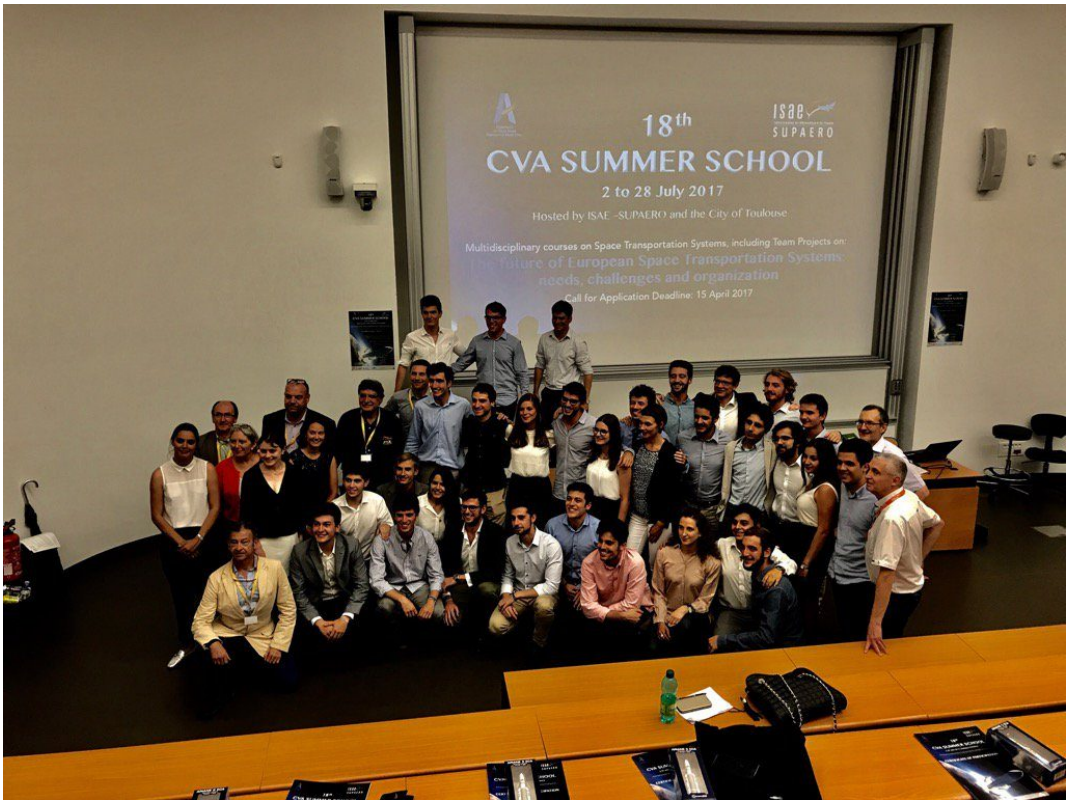
The students were then asked to comment on the organisation of the Summer School, this interaction was followed by the distribution of the participation certificates and photo opportunities.

And as when all good things come to an end, a farwell party had been organised for all the participants.

Attending the CVA Summer School was a fantastic experience, and not only because of the interesting lessons and the activities. One of the objectives of this type of course is that the participants get to know other people with different backgrounds but interested in space and technology, which allows to create a dense network of contacts at a professional and personal level.

When we met with the CVA Alumni, we observed that they have kept in contact and are friends despite that years have passed by and that they are living in different countries.

The Summer School achieved this purpose. We formed a solid group and made many new friends. This, hopefully, will remain for a long time.



Participants, organizers and members of the summer school jury at the closing ceremony.

All in all, it is an experience I recommend for engineering students interested in space and technology.

I would like to thank CVA and ISAE-SUPAERO for this wonderful Summer School. Spending a month in Toulouse was a great experience, from a professional and personal point of view, and all of that was possible due to the efforts and dedication of people from both institutions.

Diego Ortega Anatol

Student of MsC in Aeronautic Engineering at the Technical University of Madrid. I have been interested in Natural Sciences since childhood; in particular, space has always fascinated me, and I want to participate in it's exploration in the future. I also get often involved in science communication activities, as I understand that bringing science and technology to the public is a very important part of our job.