Interview Toulouse [Aveline Cloitre]

Interviewer: Who are you? Describe yourself: background and experience.

Interviewee: I am a third year PhD student studying space entrepreneurship in Toulouse. I did an internship at CNES [Centre National d'Etudes Spatiales] in 2020 to conduct a research master thesis on space entrepreneurship through the organization of the international space hackathon ActInSpace, I guess you may know it. I was in charge of the national support of the 2020 edition, and I conducted interviews to have a better understanding of entrepreneurial support in high-technological entrepreneurial ecosystems, so space constitutes a relevant field of investigation to do so. I've already been a student-entrepreneur before conducting my PhD as I sold purses at the beginning of my academic path, just after high-school, when I studied political science, economics and management in Grenoble. … This is the city where I grew up, which is high-technological hub regarding AI, nanotech, biotech and especially health. I conducted various works on these topics during my 5 years at Sciences Po Grenoble, before joining TBS and the SIRIUS Chair now. I guess this is where my passion for high-technological sectors comes from, and space brings it all together! … But yes, I was saying that I was student-entrepreneur: actually, I was found of fashion, and I created two trademarks that I managed for 3 years – I mean, they were not big brands, just mine, but it gave me a taste for entrepreneurship. I remember that I was incubated with other students, older than me, in engineering, marketing etc. So I took part in workshops with them, to classes to develop our entrepreneurial projects. I've always wanted to participate in hackathons and as I needed to do it for my internship and my research, it was really motivating. In this context, I join the hackathon with other students and engineers, I was curious to join a technical world and challenge myself, open my mind and try to understand space technologies to create something new. … Thus, I join the ALBATROS team in November. But I need to precise this not a real company

for now, but we have various ideas on how to do it, we worked on the business model etc to address the questions of the jury of ActInSpace, and we presented our project and research at the IAC 2021 in Dubai. Our project was selected to represented France at the student conference.

Interviewer: What is your project? Describe it.

Interviewee: ALBATROS is an entrepreneurial project which aims to leverage and to complement Earth Observation data from satellite operators thanks to a UAV fleet and a data fusion framework. ALBATROS provides precise, quick, flexible and continuous Earth Observation data when satellites are not able to do so. It offers a service that does not exist yet in order to help satellite operators to best answer their customers' needs, and thus to improve their performance and keep their leadership in Earth Observation services. Maybe I can give you some figures to better illustrate the issue: According to an investigation of PwC, the consulting firm, the Global Earth Observation market in 2015 represented €7 billion – If I am not mistaken. Knowing that this market relies on data provided by satellites which are partially unexploitable when there are clouds, the amount of economic losses for satellite operators is very important, right? Moreover, up to 65 % is the annual average surface area of the globe covered by clouds. If I remember well, this has been estimated by NASA. Thus, our innovation relies on the six main competitive advantages with respect to other UAV imagery data solutions. First, autonomous UAVs. Secondly, fusion with satellite data. Third, an autonomous ground station. Fourth, a modular payload. Fifth, a formation flying. And last but not least, a wide range of action, which means 300 km covered in 03h00. I mean, our main differentiation is to base ALBATROS's UAV fleet on a collective intelligence system and offers continuous data on demand under any meteorological conditions. Our flying fleet relies on material which is able to fly in most meteorological conditions. Moreover, ALBATROS requires reduced initial investments in comparison with satellites. This includes various advantages for our potential customers, which are a high-resolution state of the art imaging system, a fast UAV fleet deployment, an interchangeable payload and a frequent fly-over. Then, regarding our revenues, we thought about a business model based on a B2B commercial pattern, with satellite operators as target customers. We aimed to provide merged images compatible with customer's products and to offer

subscriptions with temporal and geographical delimitation. Moreover, we aimed to develop our project in various phases in order to test ALBATROS's technical and business opportunities. First, we wanted to have proof of concept with low expenditures by using an existing UAV platform and commercial payloads to test the autonomous flight system and the data fusion process. Then, we planned to develop our custom payload and integrate it in the final high-performance long-range UAV platform. If our tests would have been successfully completed, we wanted to create our first UAV fleet located in the most favorable geographic areas regarding UAV legislation, and with a significant cloud coverage. European autonomous UAV legislation is not yet fully defined, but priors flight approvals similar to ALBATROS have already been delivered. Once our large-scale tests will prove the reliability of our solution, we wanted to use our revenues to gradually expand our geographical coverage everywhere our clients need. Moreover, ALBATROS has a huge potential in both commercial and civil applications in a wide variety of sectors that benefit civil society, by having a more reliable and precise understanding of our planet. But this was our project. Now, it is in a "standby phase" let's say.

Interviewer: When did you decided to start a company? Describe how the idea come up?

Interviewee: My comrades and I created ALBATROS in 2020 thanks to an event, a hackathon, which is called ActInSpace as I was saying. I think you may know: it is organized every two years by the CNES, the ESA [European Space Agency] and AeroSpace Valley. CNES initiated this in 2014 I think, I am not sure. I did my internship there. And I loved it, I wanted to take part in this hackathon, I wanted to see how it was, so my corporate tutor told me that I could – even if the event was rescheduled various months later. It was held in November 2020 during the pandemic, I had no idea of what I wanted to create, to develop. So, I decided to join the warm-up of the event, in order to try to find teammates, maybe they would have had some ideas. Initially I planned to work on type of space tracker, in order to help people in queues and daily-life traffic, the idea interested various people, but it did not receive a lot of attention, because there was another idea developed by a guy working at the ESA, on EO [Earth Observation]. It was not a great entrepreneur, but obviously he had great ideas. More precisely, he noticed that he had a lot of issues

in his job regarding cloud coverage to obtain high-quality data. There is major waste regarding satellite data in LEO [low earth orbit] – I mean regarding the time it takes to go around the Earth. And ALBATROS System's innovation was based on satellite and UAVs data fusion, in order to provide complementarity data to satellites when there is cloud coverage preventing them from producing data. So we thought that it would have been interesting to address this technical and commercial issue for satellite data providers, such as ADS [Airbus Defence and Space], ESA and other organizations. … Regarding the idea, I'd say that Martino, the guy who worked at ESA, brought legitimacy to the idea, as he was a professional of the field, and in a very well-known institution, which is the European Space Agency. So I trusted him, like my comrades, to work on this idea for the hackathon and to try to develop it from a commercial perspective.

Interviewer: Describe briefly your team and organization. What was the team (university and people from outside)

Interviewee: As I already mentioned it, we did not know each other before the beginning of the hackathon, which took place in Toulouse, but in visioconference in the context of the global pandemic. We met on Teams, we each made a brief speech of our ideas or our objectives for this hackathon -some of us said "ok I am just here to join a team and for the challenge"- and then we asked the spokesperson to join the team and the idea that interested us. … We were 5 people at the beginning of ALBATROS, 4 students and one engineer at ESA. I was the only "social science" one, my comrades were studying at Supaero and INSA if I remember well. There were: Matthieu, who directly left the project after the event, but I do not remember his studies and his background, then Jean, who was studying engineering as well, and Martino, the engineer at ESA. Jean and Martino worked a little on ALBATROS with Florian and I after ActInSpace, but not that much, they stopped after the submissions we sent for prizes. … And finally, there was Florian, who has always been very involved in the project, he was studying at CNAM [Conservatoire National des Arts et Métiers] and Supaero, and working at Collins Aerospace at the same time, then he did a Master in innovation in Toulouse as well, at TBS. We both worked on the project, Florian pushed me to help him, and vice versa. We were semi-finalists, and after the event we did not maintain contact with the other teammates, because we

thought that our idea was not that great if had not won. We tried to present our idea to other prizes offered by the hackathon, but we did not win anything. So we stopped here, we were all working back on our activities and studying. Then, Martino – the engineer who had initially the idea- did not invest a lot in the project, neither Jean, but Florian and I did. … We wanted to publish our research in a space journal, but this have would required much more invest and expertise. As we all already have very time-consuming jobs, we decided to stop the project.

Interviewer: In your opinion, what are the most important skills and qualities that entrepreneurs need to succeed, and how can these be developed? (internal)

Interviewee: In my opinion, the most important skills and qualities that entrepreneurs need to succeed are the “traditional ones”: resilience and commitment. Entrepreneurship can be challenging, and setbacks are common. Resilience and persistence are crucial qualities to navigate through obstacles and stay motivated. Developing these qualities can be achieved by setting realistic goals, learning from failures, seeking support from mentors or like-minded individuals, and maintaining a positive mindset. For instance, in the ALBATROS team, I immediately understand that 3 people of the team did not have this spirit, and they said it as well when we knew each other better. Florian and I were the only one thinking about – or mainly thinking about- the business part of the idea. We investigated the costs, the commercial feasibility, the needs of our potential customers, whereas the others were working on the technical part. And it was great! We did not waste time. I guess we individually belong to the technical or the managerial part… Understanding the fundamentals of business and financial management is essential for entrepreneurial success. Skills in areas such as business planning, budgeting, marketing, sales, and financial analysis are crucial. Developing these skills can be accomplished by taking business courses or workshops, reading relevant books and articles, seeking guidance from mentors or experts in the field, and gaining practical experience through internships or part-time work in a business environment. This is especially needed for engineers…! I remember we had tools during ActInSpace to do so, to make a business model etc. But there is another thing that does not directly depend on one person, which is the Team: flexibility and communication. These capabilities will help entrepreneurs to attract talents and involved people to the company.

Entrepreneurship often involves leading a team and collaborating with others. Effective leadership skills, such as communication, decision-making, and inspiring others, are vital, I saw it. Developing leadership skills can be done through self-reflection, seeking mentorship from experienced entrepreneurs or business leaders, participating in leadership development programs or workshops, and actively working on improving your interpersonal and communication skills. For instance, Martino has these skills, he managed to convince us to join his team. But I guess he needed to work on the managerial part, and moreover, he did not really want to launch a start-up on his own, as he stopped the adventure earlier than Florian and I.

Interviewer: What are the motivations for you, as an academic, to engage a collaboration with industry?

The 3 main motivations are usually:

- professional recognition,
- gaining new insights (including test ideas, and develop creativity),
- search for funding.

Interviewee: As an academic, there are several motivations for me for engaging collaborations with industry. Of course I am more focused on the space industry and the UAV one regarding ALBATROS, but I think that we can consider various motivations in general. I'd say that the first coming to my mind is having a real-world impact. Collaboration with industry allows academics -I include PhD students..!- to bridge the gap between theoretical research and practical applications. By working with industry partners, academics can directly contribute to solving real-world problems and address industry needs. This collaboration can lead to the development of innovative products, technologies, and solutions that have a tangible impact on society. This is what we did during the hackathon ActInSpace: we answered challenges suggested by industry, and we relied on technologies developed by the CNES and ADS. This brings me to another point, which is the access to resources and expertise: Industry collaborations often provide access to resources, infrastructure, and funding that may not be readily available within

academic settings. Industry partners can offer specialized equipment, facilities, and technical expertise that can enhance research capabilities and accelerate the pace of scientific discovery. As an academic, I'd say it also help knowledge exchange and learning. I studied knowledge production systems, and I can say that collaborating with industry provides academics with opportunities to gain insights into industry practices, market dynamics, and emerging trends. This knowledge exchange allows academics to stay updated with the latest industry developments and ensures that their research remains relevant and aligned with industry needs. Conversely, industry partners can benefit from the academic knowledge and expertise, gaining new perspectives and approaches to problem-solving. Overall, collaborations between academia and industry create a mutually beneficial partnership, where academic research is applied to real-world problems, and industry gains access to cutting-edge knowledge and innovation. By combining academic rigor with industry relevance, such collaborations have the potential to drive economic growth, societal progress, and scientific advancements. And this is even more important in the context of climate change, to strengthen our knowledge on socio-environmental issues to address all these challenges.

Interviewer: What are the best practices to succeed? (internal) - What are the key components of success? (external)

Interviewee: Some of the needs remain the same: how to move a project forward. At the beginning of start-ups, the practices are devoted to methodological work on "lean start up", which aims to interview target people in order to obtain user feedback. The idea is not to wait until the project is finished before presenting it, but to co-create it with feedback before the product is finalized, in order to move it forward more quickly. So being flexible is one of the key components of success., even though this is a tricky area at the moment. Here too, motivation comes from different sources, such as personal challenges and creating a something in which we truly believe… Wow, this is so exciting. In academia this is an environment where one sometimes feels a little drowned in the mass, a passion for a field that becomes a real project, a fear of the salary world that makes adventurous profiles prefer to create their own missions and jobs. Consequently I also consider risk appetite as a component of success!

Interviewer: What advice would you give to students and scholars who are interested in entrepreneurship in the space sector ?

Interviewee: If you're interested in entrepreneurship in the space sector, I think that there are some pieces of advice that can help interested people to get them started. The first one which comes to my mind is probably to build a network, by connecting with professionals, experts, and entrepreneurs already working in the space sector. Attending conferences, industry events, and workshops to meet like-minded individuals and establish valuable connections. Engaging with space-related organizations and joining relevant industry associations can also help expand your network. This is something that helped me a lot to build my own path in Toulouse. … This would also help to identify opportunities, by staying up to date with the latest trends and advancements in the space industry. Identify areas where there are gaps or opportunities for innovation and disruption. This could include satellite technology, launch services, Earth observation, space tourism, or even asteroid mining, who knows? In Toulouse there are plenty of opportunities, such as events organized by Connect by CNES and AeroSpace Valley, but also space incubators etc for those interested in the topic. You just have to follow them on social networks, such as Linkedin. You won't miss anything then. This is probably the most important thing for future space entrepreneurs. Once they are in this network, I strongly recommend to be involved in entrepreneurial support activities to access resources, both technical and commercial, especially by developing a strong team. I mean, entrepreneurship is rarely a solo journey. … This is why I think that findings partners or teammates who complement your skills and share your passion for space entrepreneurship. Building a diverse team with expertise in different areas can greatly enhance your chances of success. I experienced it in ALBATROS, by being the only person with a background in management and law: we anticipated questions from the jury regarding the aspects. I think this help us to be semi-finalists.

Interviewer: Which obstacles did you face and how did you manage to overcome them? Have you experienced any failures? How do you perceive them today?

Interviewee: As I have already mentioned it, we did not win the hackathon neither launch a real business. I don't know if we can consider it as a failure or not, but I think that not wining a prize discouraged us to continue the project, to concretize it. I saw it regarding my teammates: they said "ok, let's stop because our project is not as good as we thought", even if there were people from ADS saying that they were interested in the project. More generally, I think all entrepreneurs face various obstacles. During the ActInSpace hackathon, I may have faced various obstacles. These could include time constraints, limited resources, technical challenges, coordination issues within the team, or difficulties in effectively communicating and pitching your project. These obstacles tested myself, my resilience and my problem-solving skills and ability to adapt in a high-pressure environment. We only had 24h to pitch an idea in front of a jury of experts. I realized that time management and prioritization are essential to make the most of the limited timeframe. Effective communication and teamwork help in addressing coordination issues and utilizing team members' strengths. I take the example of our team again. Identifying alternative approaches or seeking guidance from mentors or experts can help tackle the technical challenges we faced. I remember we asked various times what an expert of ADS thought about our project, and he supported us a lot, including at the end of the event, we asked him feedback. So we tried to embrace a flexible mindset and being open to feedback and iteration can also aid in overcoming this kind of obstacles.

Interviewer: What support did you get from university?

Interviewee: We did not. But if we had pursue ALBATROS, I guess I would have asked my school, the TBS incubator.

Interviewer: How did you get funding? What tools did you use? (fundraising / crowdfunding / call for project / credit / etc.?) / How did you reach the customers?

Interviewee: We did not get funded yet, as we are in a "standby" phase. Same for the customers, even though we identified them in our business model. But we would need to work on it better. Actually, we would need more investment to do it.

Interviewer: Do you have new fundings needs / perspective?

Interviewee: Neither for the moment. As I told you, we are not working on the project anymore. Maybe later, why not, but not for now, as Florian and I are both engaged in our jobs, and we do not have the technical competencies to push forward ALBATROS. Otherwise, we would have contacted BPI France to obtain funds for our proof of concept.

Interviewer: What resources are available to support your project?

Interviewee: There are two types of resources available to support our project. The first one is related to the resources we had during the hackathon: general, basic technical and commercial resources mostly. For instance: how to read a code, how to make a business model thanks to a business model canva etc. I remember that we could contact experts on an online platform, it was cool. But we did not have time to make surveys etc. Other teams did it because they had been working on their idea for months… they won the hackathon thanks to that. So it was not very equal on this aspect, because in our team we only met on the same day… Nevermind. Regarding the other type of resources available to support our project, they mostly deal with what we do after the event: incubators, CNES etc. I know that we can contact Connect by CNES to do so. But we are not in the right time to continue this adventure for the moment. … But I can mention various solutions directly available in Toulouse, which are also:

Aerospace Valley, which is a very well-known aerospace cluster in France, with Toulouse as one of its main locations. It provides support and networking opportunities for space start-ups through its network of industry players, research institutions, and public bodies. I worked with them for AIS [ActInSpace]. They offer access to funding, mentoring, business support services, and collaborative projects, through regional funding and ESA BIC Network. … I am also thinking about Toulouse Tech Transfer: Toulouse Tech Transfer is a technology transfer office that facilitates the transfer of research and technology from academic institutions to the industry. I know tt supports start-ups by providing access to intellectual property, licensing

opportunities, and connections with researchers and experts from Toulouse's universities and research institutes. But I am not sure if we would need that. Maybe more ADS which is the AIS partner which suggested the challenge we addressed through ALBATROS.

Interviewer: What are the consequences of academic engagement in a collaboration with industry?

Interviewee: Engaging in collaborations with industry can have several consequences for us. From my point of view, they are mainly positive. I immediately think about an enhanced research impact, because collaborations with industry can lead to research outcomes that have a direct and practical impact on the industry and society. By working closely with industry partners, academics can develop solutions, technologies, and innovations that address industry challenges and meet market needs. This can result in publications, patents, or the commercialization of research findings, thereby increasing the visibility and impact of the academic's work. And this is exactly what I do with my PhD, as I am funded by an academic-industrial chair with ADS, CNES and TAS [Thales Alenia Space]. This helps me a lot in my research, as I have access to resources, including network for me. But it can be also access to resources that may not be readily available within academic institutions. This can include specialized equipment, data, facilities, funding, or industry-specific expertise. Such resources can significantly enhance the quality and scope of research, allowing academics to conduct experiments, collect data, or perform analyses that would otherwise be challenging or impossible. For my PhD, I especially rely on interviews. I have approximately conducted 65 semi-structured interviews with top managers in the French-European space ecosystem, which is crazy. I would not have had to these people without a strong connection with industry in my research. Now I am exposed to a wider network of professionals, researchers, and industry experts. This can lead to new collaborative research projects, interdisciplinary collaborations, or maybe joint ventures for ALBATROS, who knows? Networking with industry partners can also open doors to future funding opportunities, career advancement prospects, and invitations to participate in industry conferences or events. Yes, I think this is the main point.

Interviewer: Are the benefits obtained aligned with your initial motivations?

Interviewee: In terms of experience, yes they do. I wanted to experience that, but I do not know yet what I am going to do with that. So I cannot really well answer the question for now. First I want to finish my PhD and then, I will see.

Interviewer: Are there important theme we did not discussed?

Interviewee: There is something that I observe in my research, which is the lack of a social link between the practitioners' world and the one of academics. Same for the technical and commercial worlds, engineering and managerial worlds. I mean, there is a divide between research and entrepreneurship that I do not understand. As my PhD deals with this topic, I know what are the reasons of this gap, due to administrative procedures, knowledge, mindsets etc. But from my point of view, my vision of entrepreneurship, that should not exist. People are really comfortable in their habits, their way of doing things, and they do not want to take risks due to the mindset of other people, and also because there is no financial support to do so. For instance, if a student is working on a research project for his final academic year, it is really hard for him to launch his project, to concretize and to implement it. He would need unusual authorizations, because his school is not used to do it and has no opportunities for him after graduating. Something that would be really helpful is to offer public grants for researchers, including students, as PhD candidates, in order to implement transform their ideas into concrete businesses, solutions. Because they will end their projects otherwise.

Interviewer: Do you have documents you can share with us to better understand your project?

Interviewee: Yes, I have a Youtube video that I can share with you I you want to have a better understanding of our entrepreneurial project.

https://www.youtube.com/watch?v=ivl5MIzP9Ks

Interviewer: Do you recommend us to interview someone to explore the general theme of technology transfer and spin-offs?

Interviewee: I think that you should interview David Henri, he developed Exotrail, and Fabien Apper with U-Space. They both did Supaero if I am not mistaken, or at least their co-founders, in Toulouse and lead amazing start-ups now.

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