CRESCENT COVE

Crescent Cove Conversations

featuring

Alberto Lacaze

President & CEO
Robotic Research

CRESCENT COVE

Crescent Cove Conversations

What is it and why was it created?

Fundamentally, people do business with people. Our founder series is a place where we can show the person behind the business. It will tell the story of how and why the business was started. Our series will be personal and pointed. Our founders are impressive people. Sometimes, they are following a calling to right a wrong, fill a gap, be of greater service, but in all cases, they have a great story to tell.

We look forward to you listening to their stories and learning more about these entrepreneurs.

Crescent Cove Conversations:
Alberto Lacaze, President & CEO of Robotic Research

In this series, Crescent Cove invites the insights and life lessons from the founders and leaders we've worked with over the years. Acknowledging there is no 'secret sauce' to success, these vignettes explore the human dimension of high-performing individuals and the companies they lead.

Alberto Lacaze is the co-founder and president of Robotic Research. A robotics engineering visionary, Lacaze leads the Robotic Research team in developing autonomous and robotics technology to deliver greater safety, security, and efficiency to transportation and defense markets. Alberto spoke with Crescent Cove about growing up with computer science in Uruguay, when AI was 'laughable', how moving too fast can be inefficient, and the power of detecting koala bears at 300 feet.

Crescent Cove (CC): Alberto, thank you for taking the time. Love to start the conversation with how it all began for you. Can you share with us your childhood experience?

Alberto Lacaze (AL): I was born in Uruguay, right at the cusp of when computers were coming out. I was honestly probably one of the first people in my country to learn machine language programming. I was lucky enough to go to a good school and grew up developing software and working with some of the very early hardware that was available at the time. I'd always been interested in mathematics, but never made it to the Math Olympics, though I was a finalist for my area.

CC: How did you pursue this interest in computers as a young kid in Uruguay?

AL: : Here again I was lucky in that a lot my understanding began at the same time the computer industry started in electronics. While in high school, I started automating machinery and used to sneak into the library at the local university to do some programming. The computers there were really old – in the punch card era.

I got very good at programming, assembly language, in many of the early microprocessors. I even developed an accounting software simply because there were so few people in country that had that expertise.

CC: It's clear this was an early passion. Tell us how you thought about pursuing it at the next level. How did you pick a college?

AL: I started at university taking classes in computer science while I was still in high school. I received a few scholarships to universities in Spain and France, but when I met with the university advisors, they asked me 'What do you want to do? Be a math professor? I didn't. All my interest was on the applied side. They told me, 'For that, you have to go to the US.'

I changed my whole plan to come the US, even though my English was very poor at the time. I spoke French and Spanish better than English.

I was enrolled in a small university called the Florida Institute of Technology, and when I first came, I thought I had made a mistake – that I should have stayed in Europe. Nonetheless, I came to the U.S. the summer before my first semester to take some classes and improve my English. I knew I would have to take the Test of English as a Foreign Language (TOEFL), and I think back then you needed 500 points to pass. I figured I could take either English classes or math classes to prepare, and I chose math. I already knew it and figured it would be easier for me to learn English while studying something I already knew.

There was just one problem: the instructor was a grad student who was also an immigrant. He had such a strong accent; I couldn't understand a word he said.

I had to go to him and say, 'I'm very sorry, but I don't understand a word you're saying.' He asked me, 'Can you read?' I told him I could. 'Okay, well just take the exam. If you can take the exam, you don't have to take the class.'

I could pay $400 tuition for the class or I could take the exam for $50. I took the exam. In a couple weeks, I had taken many more exams for other classes. I got a 503 or a 505 on the TOEFL. I passed…barely, but I passed.

Afterwards I went to graduate school at Drexel in Philadelphia. After Drexel, I became research faculty at the University of Maryland for a while in the late 1990s.

CC: Can you tell us more about exploring robotics as a field? What led to your specialization?

AL: In college, to make some extra cash, I used to buy retired electronic equipment, like oscilloscopes and power generators, mostly from the integrated circuit industry. Some were out of whack, but some were just not fully calibrated. I bought them as junk, refurbished them, and sold them back for money. This helped with living expenses and some classes.

> **"I remember if you wrote a paper for a conference and included the words 'autonomy' or 'learning' you would not get accepted. AI had such a bad name at the time, it was laughable."**

After UMD, I went to work for the National Institute of Standards and Technology (NIST). NIST's role was to maintain standards, not do robotics, but we got a lot of funding from the Army to create a research lab working on the first robotic systems. In the mid-1990s we automated many Army vehicles, and the Department of Defense started getting interested. I realized robotics was the future.

CC: How did you decide to start Robotic Research? Was working with the Department of Defense the green shoots of starting Robotic Research?

DO: After a while, my future Robotic Research co-founder, Karl Murphy, and I realized if we wanted to continue developing core robotics, we had to separate from NIST.

We started Robotic Research in 2002. Originally, we worked mainly with General Dynamics developing autonomous platforms. For many years they were the 800 lb. gorilla in the field of ground automation, whereas Lockheed Martin was interested in aerial automation.

For the first few years of the company, the Defense Department was our only customer. At that time, artificial intelligence was out of favor commercially.

CC: AI being out of favor? What happened then?

DO: There were many promises made in the 1980s from the first wave of AI that simply did not materialize. I remember if you wrote a paper for a conference and included the words 'autonomy' or 'learning' you would not get accepted. AI had such a bad name at the time, it was laughable. Within DOD, however, that was not the case. Very early they realized having robotic systems makes a big difference. Dull, dangerous, and dirty — "the three Ds" – always find their way into what DOD is doing. So, there is always a need for automation.

At the time, we were more concentrated on scouting, placing sensors past the civility line, dealing with smoke generators, and automating vehicles. A lot of our work was off-road protocols, because on-road driving was thought to be a solved issue. In 1986 Hands Across America showed that road automation was relatively simply compared to off-road. All the neat research and interesting work was on the unstructured environment.

Our goal at the time was to put separation between our soldiers and the enemy. One way to protect your guys is to not have them there. Automation gives distance that increases safety.

CC: How did you start working with Crescent Cove?

DO: Crescent Cove invested in Luminar, then they showed interest in us directly because we had an established business. We were working with lidars – the laser sensors that determine variable distances – long before Luminar was around. There were a few other manufacturers—General Dynamics was making their own systems at the time – but I think we were one of the first to use Lidars in ground vehicles.

Over the years we have developed a very sophisticated, wide set of capabilities for understanding and processing data from those sensors. You can think of autonomy as a stamp collection. It's not that you need some unobtainable magic to make it work. It's more being able to collect all the special cases and having something that can handle each.

For example, vehicles need to be able to handle vegetation. Or to take another example, the rules of the road in Australia state that you need to be some feet away from a koala bear. You can be within a distance to a human, but you need to stay further away froma koala bear. That means, technically, you have to be able to detect the koala bear. That's the only way to actually follow the rule. That's a very specific detector just to find that

little critter. That's an extreme case, but it's everywhere in some variant.

You need to be able to handle those cases. That's a stamp collection in the sense that you need all the pieces to safely and accurately handle it. There's no magical algorithm that can solve that problem. It's very deterministic, a specific set of rules that you need to follow. You have to customize your systems.

CC: The company has bootstrapped since founding in 2002. What was the most surprising thing you learnt in raising outside capital?

AL: Everything! It was very foreign to me. In fact, this is the first time we've conducted a capital raise. We're very different from companies that are used to VC funding. We had never gotten any funding from outside; we were always self-funded. To a certain degree, we've grown very differently as a result.

Generating revenue has always been a big priority because it's something we needed to do to continue moving forward. We have been very successful doing this because it forced us to find areas that are profitable now. We have never been able to wait for a 'Hail Mary.'

On-road or highway trucking is a good example. While regulations are changing in the right direction, they are still state-by-state. The lack of federal uniformity creates more risk. We have always been automating areas where autonomy can be impactful today, not 2 years from now. Areas such as off-road, private road, indoor facilities, the sort of areas that others stay away from because they're harder to deal with. You need a lot of tech to drive off-road, which makes it significantly harder than driving on-road. We want to be able to generate revenue as we go along.

Also, because we never raised capital, we never had a reason to advertise much, even though we probably have more automated vehicles than most companies. In trucking, we actually have close to 100 trucks automated. I think that's more than anyone else. We're already working with customers, military and commercial.

It's a more patient way of growing for sure. It takes lot of commitment of time to be able to do that. But it helps you develop a team that is very unique. We have layers. Most of our employees haven't just been hired on last month, for example. We've been moving in the same direction for many years. We were deploying autonomous systems long before many of the public companies that do this were created.

CC: Looking over the arc of your time with Robotic Research, what do you think was your most valuable mistake?

> **"Everything we make is used in a slightly different way. It's not a lack of planning or preparing, it's just reality. Customers know what they want, but they can't always express it in a set of documents that gives enough information for the engineers to know what to do. You have to remain committed to the customer"**

AL: Being a profitable company forces required discipline. That's important. It also means that you have to be able to refine the product under real world conditions. It's very hard to create a product in a vacuum and hope someone wants it. If you do it right and get lucky, you could be very successful. Normally, interaction with customers is incredibly influential.

In the past, we have automated vehicles that may not have had a big commercial market, and probably spent a lot of time and effort making them successful although the market was smaller. I see it as a happy outcome nevertheless, in the sense we've honed our operational skill set—stamps in our collection—that are useful for other vehicles and deployments.

One advantage of working with the government is they give you requirements, and when you give it to the soldier, he or she will never use it the way you expect. A lot of soldiers are teenagers, and they'll use it in ways you don't expect. It's true for everything we make. Everything we make is used in a slightly different way. It's not a lack of planning or preparing, it's just reality. Customers know what they want, but they can't always express it in a set of documents that gives enough information for the engineers to

> **"I often find that someone who enjoys what they're doing is a lot more valuable — someone who is basically having fun solving all these problems."**

know what to do. You have to remain committed to the customer and really talk about the problems they are trying to solve.

You have to test your stuff, put it in the field, let it fail, and do it again until you get it right. It takes time. It's not something you can do in a lab. It's actually inefficient to push that process faster, the way a lot of companies want to. You have to go to the field and be in enough places. Sometimes the special cases don't show up just because you have a vehicle there. Sometimes they only show up when it's raining and you have a car coming from the right-hand side, or when the sun is shining very brightly—these very strange black swan situations that you need actual experience to know how to deal with. Ultimately, you have to put yourself in enough situations to better understand and prove out the safety case.

Robotic Research Pegasus IIe drone with skids deployed down to serve as treads.

CC: You have started a few businesses and without a doubt, are an entrepreneur at heart. What advice would you give young people who want to become entrepreneurs?

AL: You have to be incredibly lucky and incredibly hardheaded. Sometimes you have to be stupid enough to not believe what you're told is the status quo, a little bit cocky to think you know better, and gigantically lucky to pick something that is not only a good technical idea but also interesting to someone. Because the best technical thing – the better mousetrap – doesn't always win.

Many of the things we do are known for being outside the box like our drone, Pegasus.

CC: The last question is one we're asking everyone in our conversations: what is happiness?

DO: I am a techie by nature. I incredibly enjoy solving new problems. I get obsessed with new problems. I cannot sleep until I get some kind of an answer, one way or another. Sometimes they're good answers, sometimes they're not good answers. But satisfying that obsession, that itch, is what makes me happy. I would be doing this job even if I was not getting paid. I enjoy it.

And I hire people that way, as well. I don't necessarily hire the smartest person. I often find that someone who enjoys what they're doing is a lot more valuable—someone who is basically having fun solving all these problems. ■

Alberto Lacaze

PRESIDENT & CEO, ROBOTIC RESEARCH

Alberto Lacaze is the CEO of Robotic Research, which was established in 2002. Mr. Lacaze holds over 100 patents in the field of robotics and hundreds of published articles. He is an internationally recognized leader in robotic engineering and frequently sought- after expert speaker at technology and industry forums around the world. As the President of Robotic Research, he oversees technical aspects of both commercial and DoD robotic systems and drives innovation around the company. Under his vision, Robotic Research has grown to become one the largest companies in ground robotics for the DoD and a leader in commercial autonomous vehicles worldwide. Robotic Research develops innovations that bring greater safety and security to public transportation and defense systems through the power of robotics and supporting technologies, such as AI and machine learning. Some company highlights include the first fully autonomous convoy trucks for logistical applications, deployment of commercial shuttles and buses worldwide, as well as the creation of a new family of transformable robotic systems that both fly and drive. Areas of expertise include AI, graph theory, controls, and optimization.

ROBOTIC RESEARCH

Robotic Research began as a small team of former NIST scientists specializing in the development of solutions to meet the unique needs of our armed forces. The company has grown into a household name in commercial and government autonomous operations. Robotic Rearch is an industry first in the industry in the following categories: 1st company DoD-approved to operate autonomously around pedestrians, 1st wartime deployments of unmanned systems, 1st unmanned autonomous trucks delivered for Army logistics applications, 1st prototype SAE Level-4 transit bus, and 1st automated heavy-duty mass transit bus used in revenue service.

CRESCENT COVE

Crescent Cove is a technology-focused investment firm that is dedicated to supporting entrepreneurs and founders. Established in 2016, Crescent Cove leverages its global network of relationships and unique insight across markets, emerging industries, and technologies to build businesses and accelerate value creation across its portfolios.

crescentcove.com

contact@crescentcove.com

415.800.2289