
C|T
the
engineering
group
A PLACE WHERE
ENGINEERS LOVE TO WORK
December 2016
index

INDEX

WHAT SETS CT APART?

JESÚS PRIETO
President & CEO

As we continue to become more relevant on the international engineering scene, we need to understand what differentiates CT from other engineering companies. Once we capture this I encourage you to internalize it, be proud of it and share it with everyone.

When I look around me and think about what our organization is today I see motivated, responsible, intelligent, and collaborative people that value long term relationships with everyone: customers, suppliers, colleagues as well the company itself. I see a nurturing work environment that leaves a very positive impression on visitors. I see a shared vision, mission and set of values that make up the cornerstone of our corporate culture. Finally, I see a solid base of engineering know-how and a very professional approach to business with a constant drive to deliver on our promises and surpass customer expectations.

But, is this all my imagination? Is this how others also perceive CT? Is this the reality? Is this how employees in other Spanish offices, in France, Germany or the UK perceive CT? Is this how our customers and subcontractors see us? Is this how society in general thinks of us? Well, we better find out. Even if this were true in a large part of the organization we need to see how we can permeate other parts, even countries, where this might not be completely true. All of this must also be transferable to the new companies that become a part of CT in the near future so they too can participate in our joint strategy and goals.

To find out, we have launched a "branding project". Over the next couple of months, this project will help us bring to light the positive "intangibles" embedded in our culture; things that we take for granted and must be recognized and made tangible. These are precisely the things that set us apart from our competitors. Once we understand the essence of our competitive advantage we will be able to better communicate it to each of our stakeholders: customers, subcontractors, and society in general. Most importantly, this effort will allow each of us to understand these key value-adds, internalize them, be proud of them and reverberate them with everyone. I want to thank each of you for joining us in this attempt to capture what makes us special, and, most importantly, for what you do each day to help set CT apart. ■

index

The aeronautical business units continue to grow. Our strategic goals include obtaining excellent results, consolidating our position in the sector, and keeping ourselves at the cutting edge. This year continues to be a great year for aeronautical activity at CT. Among the milestones, The CT Engineering Group consolidated its relationship with Airbus Group thanks to the renewal of its qualification as an Engineering Supplier Strategy (E2S). Earlier this year, another milestone was achieved when Airbus Defence & Space Engineers informed CT of the awarding of MultiCo, a contract to provide engineering services for the Airbus division. Finally, CT extended the technical signature delegation to all Airbus Group. These three achievements have been added to CT´s curriculum, which also includes its qualification as Manufacturing Engineering Services Strategic Suppliers (ME3S) for Airbus achieved in 2014.

THREE AERONAUTICAL ACHIEVEMENTS AT CT IN 2016

Index

1 ENGINEERING STRATEGY SUPPLIER (E2S)

In May, Airbus Group renewed the rating of The CT Engineering Group as Engineering Strategy Supplier (E2S). The evaluation process measured, among other categories, positioning, business strategy, rate of quality of projects and services as well as KPI's. The result was very satisfying for CT. Airbus Group told us that CT is located within the top five.

CT excelled in the evaluation carried out by the Airbus Group steering committee (Airbus, Airbus Defence & Space and Airbus Helicopters). Among our strengths was our team of individuals that surpassed customer expectations by providing quality and timely services at a good price and with international presence.

This rating allows us to be part of a select worldwide club as engineering supplier for Airbus Group strategy. Airbus Group granted just 17 global licenses and The CT Engineering Group has one.

This milestone consolidates the strategy of the company to be present in all areas of engineering, from analysis requirements and product design, through engineering production to after sales support and maintenance. Among the wide range of services included in the three-year contract (2016-2018) are: mechanical design and airframe, powerplant integration, system engineering, manufacturing engineering, data configuration, supportability, GSE, engineering support and service bulletins.

CT remains one of the leading companies for the provision of engineering services in areas related to the definition, development and post-sales support for all products of the Airbus Group. This contract will allow the company to consolidate a strong team of professionals and will put The CT Engineering Group in a position of great responsibility in the aeronautics, space and defense sector of the engineering business. A significant workload is expected in the next three years.

The CT Engineering Group and its national brands (CT Ingenieros, CT Ingenierie, CT Ingeneure, and CT Engineering Group UK) continue providing industrial services and structural engineering design services.

CT understands the product in its entirety and has been working with this philosophy to help consolidate a business relationship with Airbus. Since 1998, CT has been contributing engineering services to Airbus in its flagship aircraft programs, including work on the A320, A380, A330MRTT, A350 and A400M. CT was selected for the first time as an E2S company in 2008, which allowed us to work with all companies within Airbus Group.

The tasks of The CT Engineering Group are not limited to the design phase. Our work also encompasses the manufacturing processes and helps to design the product manufacturing strategy. We also perform engineering activities in the post-production phase: such as certification, support or documentation of the after-sales of the product. The E2S rating allows us to be involved in all product stages, giving us insight into product design and helping us to offer solutions that can provide substantial improvements across the product life cycle.

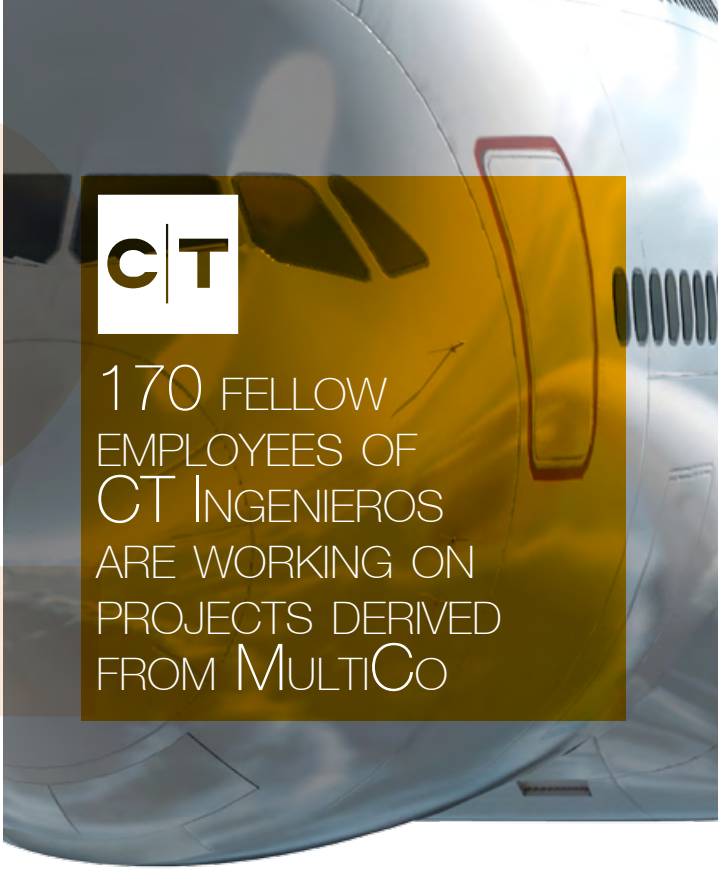
CT's re-appointment as an E2S preferred supplier demonstrates the success of our consistent strategy of providing timely quality services. CT is a transnational provider for Airbus Group and our work covers a broad range of engineering services utilizing flexibility and technical capacity. ■

CT

THIS MILESTONE CONSOLIDATES THE STRATEGY OF THE COMPANY TO BE PRESENT IN ALL AREAS OF ENGINEERING

index

MultiCo



170 FELLOW EMPLOYEES OF CT INGENIEROS ARE WORKING ON PROJECTS DERIVED FROM MULTICO

Earlier this year, Airbus Defence and Space communicated with CT about awarding them the MultiCo. This contract to provide engineering services for Airbus Defence and Space is valid for three years and would ensure an increased workload for CT. In addition, it becomes an essential way in for the awarding of the MultiCo in Germany.

The three-year contract (March 1, 2016 - February 28, 2019) covers the outsourcing of various tasks from 30 different departments in Airbus.

For this reason, the MultiCo contract has a large reach and gathers a large volume of work that touches virtually all areas of engineering that make the development process of an aircraft. This ranges from mechanical areas such as structural design, stress or flight physics to the other related aspects in the field of software and mission systems, flight tests or simulation systems.

It has been a long process. CT Ingenieros began working on it the summer of 2015 with the publication of its tender offer. In September of that same year CT delivered the offer. A document preceded by numerous meetings, presentations and negotiations. In February 2016, CT Ingenieros received official notification of the award by Airbus Defence and Space.

Pedro Pérez, Business Unit Manager for Systems Engineering, says that this process included the involvement and collaboration of various Business Units (Stress, Design, Engineering [in Madrid]) and of the 11 providers who are part of what has been called 'The CT Engineering Consortium.' All of them were led by Business Units from Systems Engineering.

The project involves the provision of engineering services in the form of Work Units. A Fixed Price Unit (FPU) or Work Unit is the predefined work that is evaluated by our client. In this case, Airbus Defence and Space described in each Work Unit every job to develop and deliverables associated with it. CT Ingenieros, meanwhile, gives a fixed price for each Work Unit defined and with this price a catalog of activities is generated that Airbus Defence and Space will use throughout the three-year contract.

To illustrate this project, imagine Airbus Defence & Space defines a Work Unit called 'Completion of Element Manufacturing Diagram' in which the work unit describes the type of parts to document, the deliverables and the associated deadlines. "CT would assess this Work Unit at, for example, 100 Euros. From here, once CT has been selected as a supplier, Airbus Defence and Space could ask for 10 of the previously defined work units and we would elaborate 10 plans for which they would pay us a total of 1,000 €," explains Pedro Pérez.

In the MultiCo contract there are a total of 30 cost centers involved and CT Ingenieros has been selected to work in 18 of them. Each cost center has a distinct amount of workloads. Therefore, "in reality CT Ingenieros is enabled to work in more than 80% of the overall work since we have been selected in 9 of the 10 largest cost centers," says Pedro.*

This contract is important for CT as it represents an important part of the workload for Systems Analysis at The CT Engineering Group. "Additionally, it consolidates us as one of the two largest companies in this type of global work for Airbus D&S in Spain and conveniently positions us to face the German MultiCo", comments Pedro, adding that "when Airbus Defence

*Cost centers in which CT has been selected

Product and Flight Safety	Systems Labs	Structural Analysis
CAD Methods, Processes and Tools	Mission Systems	COMMS Systems Integration
Avionics and Electrics	Flight Tests and Operations	Mission Support Systems
Air to Air Refueling	Aircraft Development Flight Tests	CLAEX Support
Flight Physics	Aircraft Acceptance and Delivery	UAS Ground Station and Avionics Systems
Systems Support	Structures Design	Simulation Systems

index

and Space needs a job completed, depending on the type of work required, this is assigned to CT Ingenieros or any other company in the consortium according to certain criteria of availability, technical suitability, etc. Once the work is completed, CT Ingenieros invoices customer Work Units corresponding to the contracted amount and we pay our partners accordingly."

CT Ingenieure has been selected for MultiCo in Airbus Defence and Space Germany in three specifications. As of now The CT Engineering Group is the preferred supplier for engineering services in Germany in the scope of military and combat aircrafts. "This selection represents a new step in the development of the CT Group in Germany and will give us the opportunity to consolidate our presence in Airbus Defence and Space", points out Francisco Marín, Country Manager in Germany and Key Account Manager for Airbus.

170 fellow employees of CT Ingenieros are working on projects derived from MultiCo. These activities are conducted under the supervision of Miguel Montoya, who has been appointed project manager. The work gathers together highly diverse areas of engineering. For this reason, CT Ingenieros is responsible for leading a consortium (The CT Engineering Consortium) in which two strategic partners participate (Centum and Temai Engineers) as well as nine specialist companies (Accenture, C-ITD, DIP, Defensya, GMV, ICEMM involved, Orbital, SERTEC and Theralabs).

The work derived from MultiCo is predominantly based at Airbus Defence and Space in Getafe although there are also tasks performed in Seville (approximately 2% of the work). "However, the trips are all very common in this type of activity, we have engineers continuously traveling to different sites of Airbus in Europe (Toulouse, Hamburg, Munich, Bristol) and other locations in client countries or those made flight test campaigns," Pedro affirms.

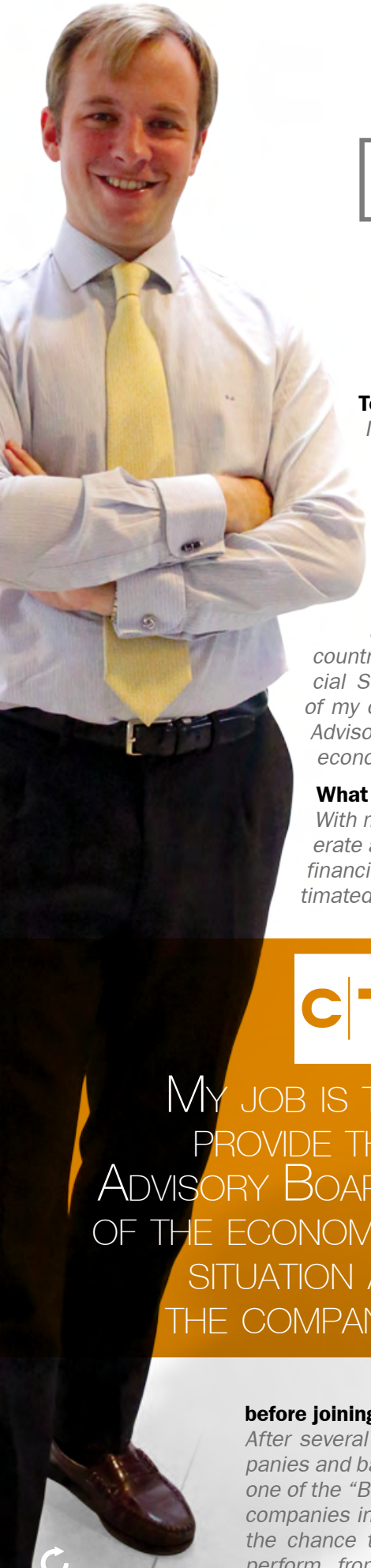
In short, the MultiCo strengthens the position of The CT Engineering Group as a supplier of engineering services for Airbus Defence and Space. ■

3 TECHNICAL SIGNATURE DELEGATION

Technical signature delegation is a very important strategic step. Signature Delegation was a mandatory requirement to be kept within the short group of E2S strategic suppliers for Airbus. During the TDCA (Technical Development Capability Assessment), that started back in July 2015, several Departments and Business Units worked closely together resulting in the effective Signature Delegation in some WP (work packages) from Systems Engineering.

In parallel, we have caught the eye of Airbus and were granted with a Signature Delegation in other areas, like Design and Stress. With this, The CT Engineering Group gains both independence and responsibility, since we are now allowed to issue and check technical contents on behalf of Airbus. This delegation is solid evidence that our organization is robust, reliable and transnational, fulfilling all international standards and requirements. ■

index



DIEGO JIMÉNEZ

Finance & Strategy Manager in The CT Engineering Group

Tell us who you are?

I am Diego Jiménez, and I joined CT Engineering Group in April 2016. Further to my position as Internal Auditor, where I perform auditing tasks for CT Engineering and CT Solutions; I am actively involved with the harmonization of Accounting and Financials in the various countries where we operate. Financial Strategy has become also part of my objective. My job is to give the Advisory Board an overall view of the economic situation of the CT groups.

What do you do?

With my experience in the field, I generate a periodic analysis report of key financial indicators showing underestimated opportunities of improvement, and the areas of risk that might jeopardize the performance of the group.

I help to manage risks and to control certain non-financial processes in order to ensure that all issues affecting the survival and prosperity of the companies are taken into account. I provide the Board, and other interested parties, with the evidence that the business is managed effectively.

What did you do before joining The CT Engineering Group?

After several internships in consulting companies and banks, I started working for PWC, one of the "Big Four" auditing and consulting companies in September 2007. There, I had the chance to understand how companies perform, from the ground level up to management. I have audited various industries including companies such as PSA Peugeot, Aciturri, Bosch, and more.

After five years working at PWC, I was asked to join General Dynamics, the world's third largest multinational conglomerate in the Defense Industry. I was a Senior Business Analyst and the right hand of the CFO for five years, the last of which I was selected to join the "high potentials" talent development program. While at GD; I was responsible of controlling and reporting key financial metrics at the European Headquarters, located in Madrid, to the USA where the Corporate Headquarters are located.

What is your background and education?

Born and raised in Madrid, I am married to Gadea and we have a one-year-old daughter named Olivia. For the last eight years, Gadea has worked at Manos Unidas, a worldwide NGO, managing development projects primarily in Asia and Africa.

While I was in High School, I had the chance to live abroad–one year in Dublin and one year in Cleveland, Ohio. Later I studied Finance Administration at Carlos III University in Getafe. After several years working, I completed an Executive MBA at IESE Business School, which gave me a perspective of how companies and their individuals behave from a management point of view.

Someone has told us that you are nature lover, is that right?

I am passionate about the countryside, and every weekend available I like to go there with my family, breathe in the fresh air, and escape from the traffic jams and the busy city life. This is how I press the "restart button" and am able to start Monday full of energy.

I am overwhelmed by how the CT family has welcomed me, so I can only hope to give back to this new family as soon as possible. To do that, I will work hard and with a team spirit in order to be integrated into this great family. ■

MY JOB IS TO PROVIDE THE ADVISORY BOARD OF THE ECONOMIC SITUATION AT THE COMPANY

index

NEW ENERGIES AT CT

The CT Engineering Group continues to expand its range of services with the opening of the Electrical Engineering Business Unit in April 2015. This team will develop electrical engineering projects and aims to provide internal services to other business units in all things related to electrical engineering.

They made their entrance into The CT Engineering Group as a group determined to continue providing electrical engineering services of the highest quality. They immediatley fitted into the work climate and brought with them a repertoire of good practices for the company. “The stability and security at CT gave us a good impression because we only had to worry about working,” said Asier Gutiérrez, Business Unit Manager. The group also brought with it a portfolio of clients who rely on their services. Their experience and mutual understanding makes the team work like clockwork: engineering services completed in proper time and with excellent quality to meet customer needs and gain their trust.

Since then, the Electrical Engineering Business Unit has been consolidating projects in the electricity sector, both in the transmission and distribution market as well as in power generation. Many of the projects the business unit is involved in are turnkey projects. The basic engineering is done from the beginning of the project to its final installation. “One of our services that differentiates us from the rest of the business units is our project commissioning. That is, our BU employees working in facilities around the world,” says Asier.

ONE OF OUR SERVICES THAT DIFFERENTIATES US FROM THE REST OF THE BUSINESS UNITS IS OUR PROJECT COMMISSIONING

index

The Electrical Engineering Unit has the ability to perform complete projects, both nationally and internationally, including engineering design, installation, design manufacturing of electrical enclosures and commissioning of high voltage (HV) and medium voltage (MV) electrical substations. These facilities may be either Air Insulated Substation (AIS) as Gas Insulated Substation (GIS). "The difference is that the AIS components are uncovered and outdoors as opposed to the GIS components which are within tubes that contain a sulfur hexafluoride (SF6) gas which allows the distance between the components to be shorter because the gas functions as insulator and the substation is more compact," explains Asier.

OUR MAIN GOAL IS TO MAKE OUR CUSTOMERS MORE COMPETITIVE

The Unit´s portfolio also includes engineering services for the sector of renewable energy such as hydroelectric plants, as well as for high power services, such as mini power plants and offshore wind farms.

The Wikinger offshore windfarm is being developed by Iberdrola in the Baltic Sea. CT Ingenieros has participated in the construction of substations to monitor the installation and commissioning made Navantia shipyard in Cádiz (Spain). This first phase ended in July and since September they have been working on the commissioning of the Wikinger offshore windfarm in Germany, where Carlos de Castro is now stationed.

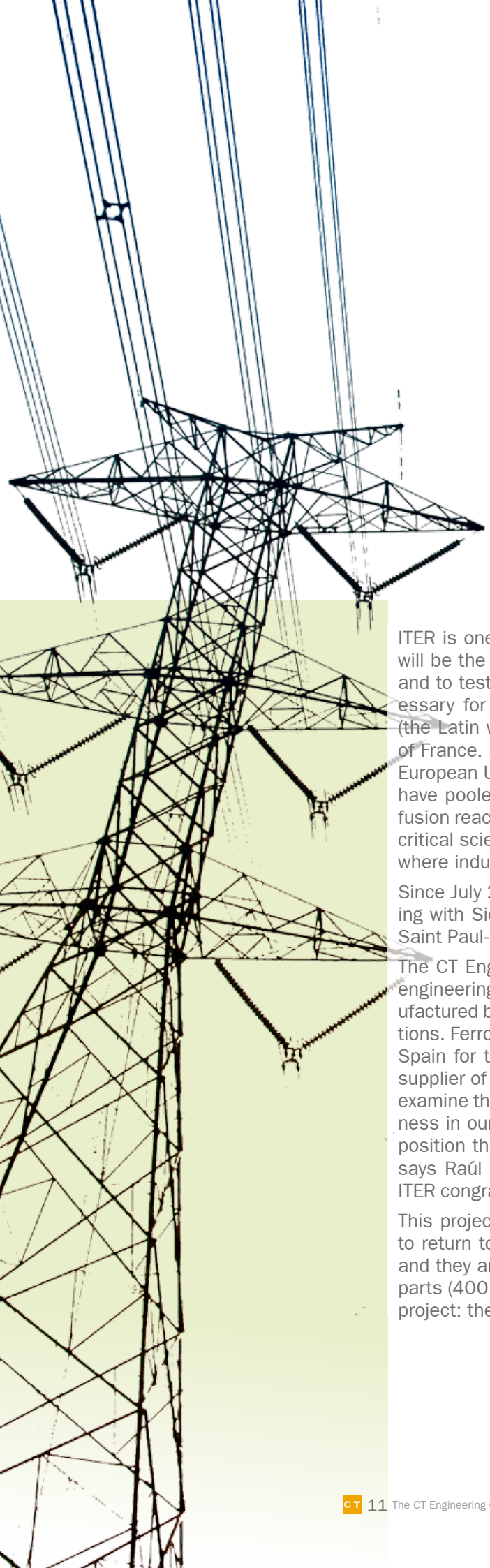
The Electrical Engineering BU shares with other business units of The CT Engineering Group their commitment to innovation and adaptability. In their daily work they have incorporated the handling of the latest CAD / CAM technology that allows them to optimize working time and be more efficient. "Our main goal is to make our customers more competitive because our engineering work is oriented toward increasing our client´s efficiency and allowing them to differentiate themselves from their competitors," says Asier.

From CT´s office in Getafe, the base of its operations, its portfolio of clients and projects increases. Ongoing projects such as ITER and ST Wikinger are already part of its customer base of engineering services. In an initial phase is a project with Tesla Motors, an American company of 100% electric cars. "We will participate in the engineering design of the transformer and electrical connections for the Tesla supercharger," Asier commented.

The team´s functionality allows them to establish collaborations with the BU Industrial Plant team, who emerged the first collaboration in a petrochemical project, and make offers with the other teams, for instance the team in Bilbao, led by Diego Pacheco, and with the Architecture, Engineering and Construction BU led by Éber Rueda. "We want to establish synergies with other units in everything related to electrical engineering: electrical instrumentation, manufacturing of electrical enclosures in other projects, calculations of consumption, etc.," states Asier. The electrical engineering team allows The CT Engineering Group to expand their catalog of engineering services and enhance our competitiveness in technical offers.

Recently, Joan and David Piedrafita have joined the team, which will allow us to participate in projects for alternators and engines. One of their strengths is the manufacturing of excitation systems. These final products require a high degree of R&D to achieve a high performance at a lower cost.

The next steps for the BU are to focus on identifying new market niches with customers and collaborate with them to meet new needs. For instance, they have considered remote control engineering in renewable energy. What is clear, however, is that this "energy" will acquire an orange and white tint, indicating that this will stay lit for a long time. ■



ITER: THE BIGGEST FUSION REACTOR IN HISTORY

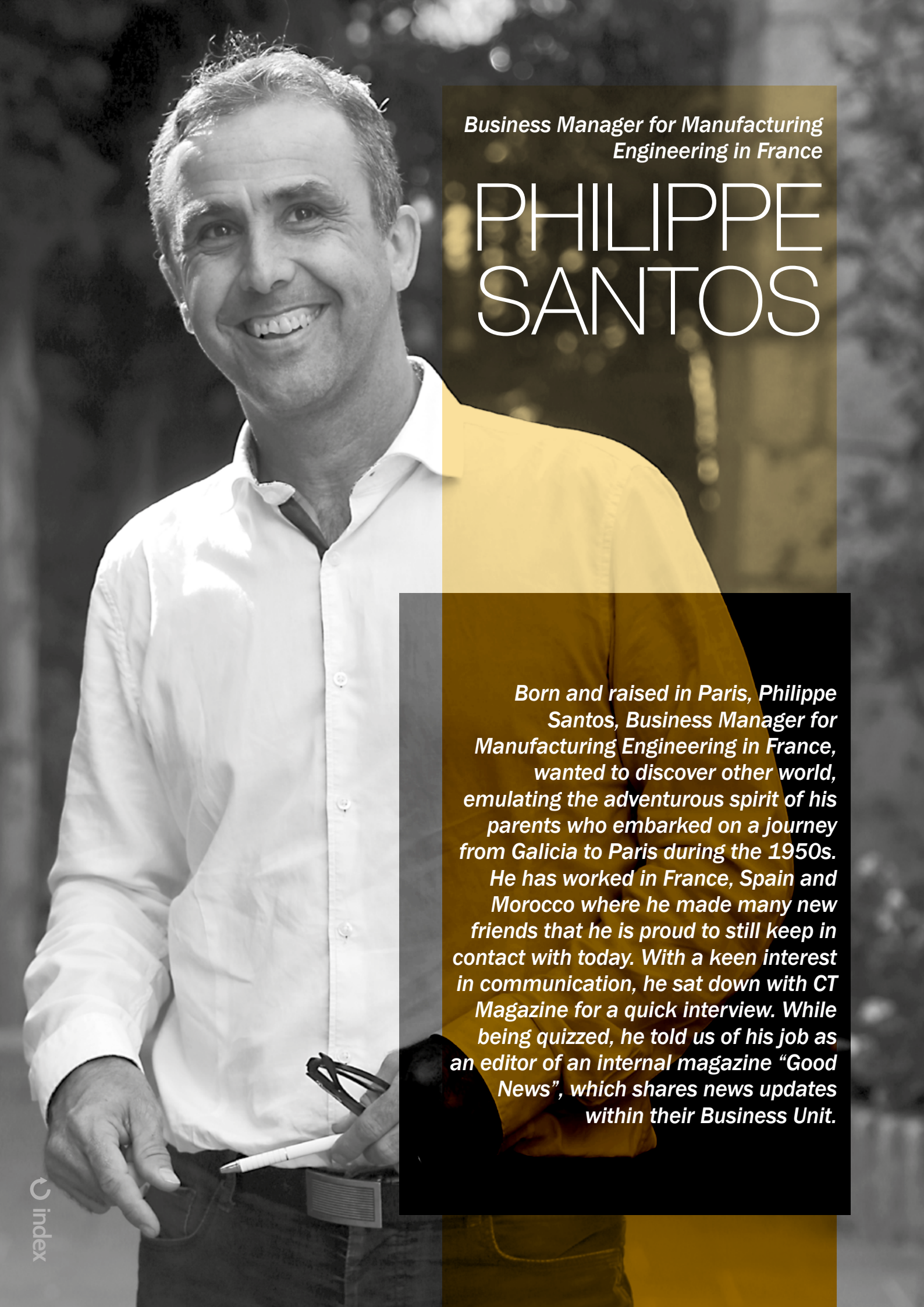
ITER is one of the most ambitious energy projects in the world today. It will be the first fusion device to maintain fusion for long periods of time and to test the integrated technologies, materials, physics regimes necessary for the commercial production of fusion-based electricity. ITER (the Latin word for the way) is currently under construction in the south of France. Seven members support this international project: China, the European Union, India, Japan, Korea, Russia and the United States. They have pooled their financial and scientific resources to build the biggest fusion reactor in history. ITER will not produce electricity, but it will resolve critical scientific and technical issues in order to take fusion to the point where industrial applications can be designed.

Since July 2015, the Electrical Engineering Business Unit has been working with Siemens and Ferrovial on the ITER Project (180-hectare site in Saint Paul-lez-Durance, southern France).

The CT Engineering Group started doing the supervision of the existing engineering on the 400 kV and 22 kV pannels of the American part manufactured by Siemens and received by ITER to install them in their substations. Ferrovial is in charge of the integration jobs and reports to Siemens Spain for the revision of the pannels. The CT Engineering Group is the supplier of the study. Ferrovial later expanded the work of Siemens/CT to examine the 6.6 kV pannels of the American part (PBS43). “Our thoroughness in our work has allowed us to establish ourselves and get better a position than other companies that have been working longer for ITER,” says Raúl López Seva, engineer and head of the ITER project. In fact, ITER congratulated The CT Engineering Group for the quality of their work.

This project has opened new doors and has allowed Ferrovial/Siemens to return to commission new jobs. The team has increased their scope and they are now working on the complete integration of all the different parts (400 kV, 66 kV and 6.6kV) for the other big substations of the ITER project: the Chinese part (PBS41). ■

index



Business Manager for Manufacturing Engineering in France

PHILIPPE SANTOS

Born and raised in Paris, Philippe Santos, Business Manager for Manufacturing Engineering in France, wanted to discover other world, emulating the adventurous spirit of his parents who embarked on a journey from Galicia to Paris during the 1950s. He has worked in France, Spain and Morocco where he made many new friends that he is proud to still keep in contact with today. With a keen interest in communication, he sat down with CT Magazine for a quick interview. While being quizzed, he told us of his job as an editor of an internal magazine "Good News", which shares news updates within their Business Unit.

index

How did you get involved in CT Ingenierie?

In 2012 I opened my consultancy company. Before that, I worked in Madrid and met many businessmen; among them were Jesús Prieto y Vicente Egea. Later, they got in contact with me to discuss how to develop the business further from their location in Toulouse. For two years I was a consultant in contact with Vicente and with Francisco Marín (Curro). In this period we got the accreditation to work with Airbus Helicopters in Marseille. After getting accredited with ME3S, they asked me to form part of the staff and I assumed responsibility as a manufacturing engineer in France. I liked the mentality and the personal treatment from Jesús, Vicente, Curro, Ignacio López, Cristina Raso, Pedro Pérez, Ana López,… So I accepted the offer and began working for CT in July 2014.

I LIKE MANUFACTURING ENGINEERING BECAUSE IT IS THE STAGE WHERE YOU CAN TOUCH AND SMELL THE PRODUCT

After more than two years now, how is the experience going?

It is very intense and there is a lot of work. We opened Nantes and new businesses in Toulouse. But I undoubtedly appreciate the trust and autonomy that the people at The CT Engineering Group give to us. This is what CT does differently from other companies. Here, we work based on trust, and that translates into happiness and excitement.

What was your introduction into the working world?

I started working in Paris at a company called Labinal (Safran), working on a harness for motors in airplanes, cars and tanks. After that I was in Dassault and in Assystem as a manager for the electrical engineering department in France for 12 years. In 2000, Assystem, together with Snecma (a company that manufactures airplane motors), were looking for a General Manager to open their first office of aeronautical studies in Morocco. I accepted and left to Casablanca for four years to work on everything related to airplane compressors. Upon finishing my work there I had a team of 80 engineers and technicians.

After four years enjoying the great climate, I returned to Paris and thought that it was the moment to change company. I left to become a managing director for the south of France (Bordeaux, Toulouse, Cannes and Marseille) in Akka Technologies, and with my family we settled in Toulouse. This adventure lasted only three years because I did not like the way they worked. Later on, I took 18 months to help a friend who was president of ASTEK that took over the presidency of ASTEK Mecatrocique and of various offices (Ales, Toulouse, Lyon, Paris) who worked for clients such as Siemens, IRISBus, MGI, Delphi, Renault VI, SNCF, RENAULT Trucks, VISTEAO, Meca-Plast etc….

I wanted to involve myself in aeronautical production and I left for GECI where I worked for 18 months as a manager for Madrid, Toulouse and Marseille. I was also in charge of the business strategy in France. I spent a lot of time on the airplane and I left when ALTEN bought GECI.

Why this change towards manufacturing engineering?

I like very much to see the product and how it is manufactured. The process is much more concrete and closer to reality. You can touch and smell the product, although it smells like oil!

Why did you decide to study electrotechnical engineering?

I really like to draw. When I was young I would take paper and imagine things. When I started to study technology, things were very undeveloped, so I liked to imagine what I could create with electrical equipment to take information from one point to another in an airplane.

What hobbies or interests do you have?

The first is playing rock guitar. Twice a month I play concerts and we need to rehearse as well. The second is playing tennis, or at least trying to. I like to exercise. And lastly, I like to get on my motor bike and go with my wife to the Pyrenees on the weekends. And of course, my family and friends are very important to me. For work reasons I have traveled a lot and it has allowed me to have many friends. I am delighted that my house can be a meeting place where my friends from France and Spain can come. ■

index

Andrei Andrei
& Miguel Montoya

POWERPLANT INTEGRATION IN AIRCRAFTS

Since 2011, The CT Engineering Group has been a major supplier for Airbus for the integration of powerplants into aircrafts; both the propulsion system integration and the auxiliary power unit (APU) integration.

These activities are carried out predominantly in Toulouse and in Getafe by a team of more than 50 engineers, most of them members of The CT Engineering Group family for many years. Our experts are involved in the development of new aircrafts as well as the continuous support of in-service aircrafts.

Support for all the components of the powerplant

The technical studies realized by our teams provide solutions for all the types of problems related to the physical and functional integration of powerplant systems in all aircraft interfaces.

The studies for propulsion system integration concern: the engine, the nacelle, the engine controls and all the systems around the engine (reverse system, oil system, fuel system,…).

The studies for APU system integration concern: Auxiliary Power Unit turbomachinery, all the Auxiliary Power Systems components (controllers, air intake, starter generator…) and the APS controls.

Studies during all the life cycle of aircraft program

The CT teams support the Airbus by integrating the Powerplant systems in an aircraft during the entire development phase, support studies related to the continuous support and the continuous development and realize technical research studies for new engines.

During the development phase of a new engine our teams ensure the requirement definitions, specifications, design, development, test definition and follow-up, certification and industrial ramp-up until series maturity of the products and their associated components.

In the frame of the continuous support our teams provide answers to the operators requests, analysis of the encountered problems, identification of potential solutions to correct in service problems (such as repairs, interchangeability, technical adaptations, etc.) and other activities related to continuous airworthiness of the fleet.

In the life of the aircraft, the products and their associated components evolve due to diverse product improvements requiring a modification. This is the scope of the continuous development activities of our teams.

The CT Engineering Group experts are involved in several R&D activities to provide innovative solutions for new engines and new APUs.

index

Support for all the aircrafts produced by our customer

The CT Engineering team have made an important contribution to the powerplant integration during the development phase on all the aircraft developed by our customer over the few last years: A320neo (for the two new engines: one from Pratt & Whitney and the second one from CFM), A330neo, A350 (for the two versions A350-900 and A350-1000), A400M.

Our activities related to the continuous support and the continuous development concerned all the aircrafts in use. The R&D activities concerned all the new engines and all the new solutions for system and components in the powerplant scope.

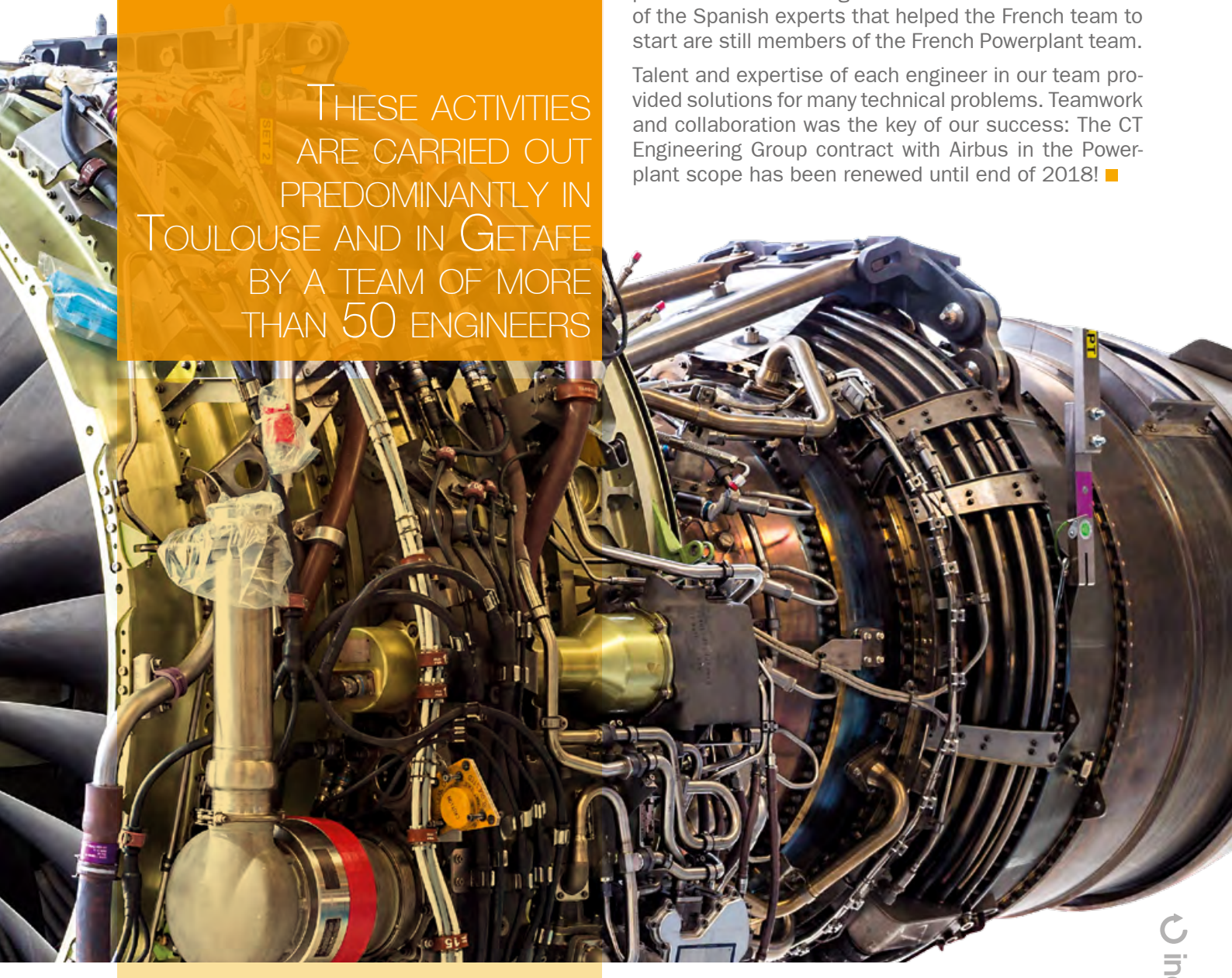
A teamwork success for a transnational project

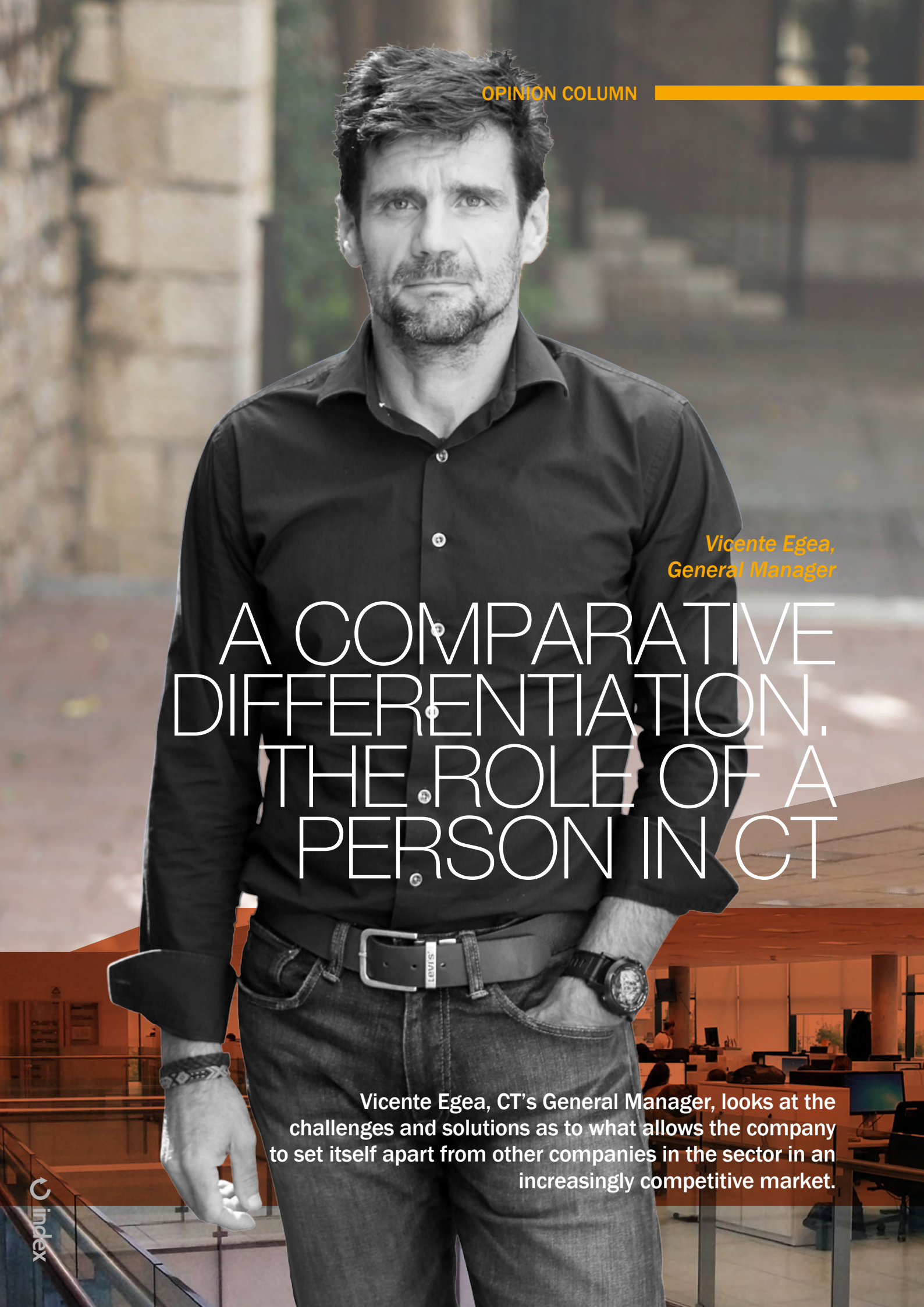
This project is a very good example of how synergies and working in close collaboration within The CT Engineering Group leads to success. Systems Engineering BU in Getafe and Systems Engineering BU in Toulouse have worked together on this project from the beginning and continue working together efficiently.

When these activities started in Toulouse, the French team had no real expertise in the scope of the project. The Spanish managers helped the French team from the beginning. Spanish engineers, experts in Powerplant specific scopes trained and worked with the French engineers to find solutions to the technical problems and challenges of the new activities. Some of the Spanish experts that helped the French team to start are still members of the French Powerplant team.

Talent and expertise of each engineer in our team provided solutions for many technical problems. Teamwork and collaboration was the key of our success: The CT Engineering Group contract with Airbus in the Powerplant scope has been renewed until end of 2018! ■

THESE ACTIVITIES ARE CARRIED OUT PREDOMINANTLY IN TOULOUSE AND IN GETAFE BY A TEAM OF MORE THAN 50 ENGINEERS





Vicente Egea,
General Manager

A COMPARATIVE DIFFERENTIATION. THE ROLE OF A PERSON IN CT

Vicente Egea, CT's General Manager, looks at the challenges and solutions as to what allows the company to set itself apart from other companies in the sector in an increasingly competitive market.

The world around us is boiling. Once someone comes up with an innovative idea and launches it to the market, hundreds of companies soon appear offering similar or even improved products. Differentiating ourselves from the competition is becoming increasingly difficult.

In this environment, more and more companies choose to differentiate themselves not so much in what they do but how they do it. There are very few companies with the ability to maintain an innovative product or service for a long period of time that differentiates them from their competition. However, copying the way that companies provide their product or service to market is not so easy. And this is a significant competitive advantage that customers appreciate.

For us in CT this trend is not new. In fact, most of our history has been linked to markets where the differentiation between us has not been in what type of services we provide. If you compare the portfolio of services we offer with those our competitors do, you will see what I mean. There are no major differences. Therefore, since our beginnings, we have tried to compete by differentiating how we offer these services. The result is that CT has a certain character that our customers and people who work for us here recognize as our own.

SINCE OUR INCEPTION, WE HAVE TRIED TO COMPETE BY DIFFERENTIATING HOW WE OFFER THESE SERVICES.

These are the traits with which we have managed to differentiate ourselves from our direct competitors. For example, our customers appreciate that CT employees remain with the company for a long time. When we go to a client to provide a service and do a good job, they rely on us for the next one. More often than not, they ask us if the employee still works here and in many cases find an affirmative answer. Once we know what the client values - in this case employee longevity - we implement operational processes that make sure this is achieved. We always try to take care of people who work with us with concrete and various measures to help them. Examples of this include flexibility in scheduling, work environment, transparent information and fair treatment.

Managing to differentiate a company in the how is just as difficult as managing to differentiate a company in the what, because the way to achieve both of these goals relies on both the company procedure and the people involved. That is why people are essential in this scheme. No matter how well established the procedures are, if the person who is carrying them out for client does not do it properly (understanding properly as representing the sum total of all the attitudes and values of the company that the customer appreciates), it becomes impossible to effectively differentiate ourselves in the how. The sum of people and processes is therefore the key to effective differentiation.

Consider another example. Another attitude highly valued by our customers is that we are a pleasant company to work with. If the customer needs something, we adapt. We try not to create conflict or customer problems. We work in anticipation of our client's needs and make life easier for the client. Can we aspire to differentiate even further? Of course. But this requires that people in contact with the customer, from the General Manager, through the Project Manager and Engineer or Technician involved in the project, have this attitude of helpfulness, flexibility and willingness to iron out conflicts that may arise. In short, to propose solutions and to foresee and mitigate the problems that will may arise.

The next question is how to get people to adopt this behavior? Not one, not 50%, but the vast majority. Therein lies the real difficulty in how to differentiate the company –having the vast majority of employees behaving like a single individual. Although there are no magic recipes, the first thing to do is to communicate very clearly what those behaviors are that we ask of our employees, making it clear that it is important for the success of the company. In addition, we must develop internal procedures that are in line with our intended goals. An example of this is our personality test that helps us select people who have a natural inclination to help others.

C|T

THE SUM OF PEOPLE AND PROCESSES IS THEREFORE THE KEY TO EFFECTIVE DIFFERENTIATION.

Finally, it is essential to keep all this in mind on a daily basis. This applies to new employees and as well as to the rest of us, since this is the only way for customers to perceive us as different and therefore ensure their loyalty in the future. So to all of you and myself included, this article is a reminder for us to maintain the values that we should hold as a company. ■

index

WORK HARD, BE TRUSTWORTHY AND DELEGATE ARE THE KEY STRATEGIES

Country Manager of CT Ingenieure in Munich

FRANCISCO MARÍN

After several years working in France, Francisco Marín moved to Munich to become Country Manager of CT Ingenieure. His main goal is to build our name in the country, working together with site managers to reach a critical mass of people and businesses in the coming years.

"When I started working for CT I didn´t know what I was going to do". It was April 1998, and Francisco Marín, who we know as Curro, had started working on numerous projects. In a calm and a steady tone, he recalls the challenges he overcame after crossing the Pyrenees to launch CT Ingenierie.

In June this year he relocated to Germany as Country Manager for CT Ingenieure. 18 years after joining CT, his statement "I didn´t know what I was going to do" had undergone a metamorphosis and had become an important part of the international growth of The CT Engineering Group. Curro talks to CT Magazine from his office in Munich.

What are the next steps for CT Ingenieure?

Most importantly, the next steps will be trying to coordinate our efforts and establish priorities for organic development as well as for possible acquisitions. Our work with Ralph Unglauben (Business Unit Manager [BUM] in Southern Germany) and Martin Henne (BUM in Northern Germany) is fundamental. Fortunately, in Germany we have around 20 employees and we are surrounded by people who know the particularities of the country and the engineering sectors.

"Commitment, boldness and non-conformism." This is the virtuous triangle that Curro draws to describe Ralph Unglauben and Martin Henne. "Unglauben and Henne have worked hard to develop CT Ingenieure. They were courageous to accept the challenge of developing an emerging company in Germany and they were mavericks because both had come from big companies," argues Curro.

Francisco Marin´s first steps in CT were as an Engineer in the area of structure designs and he steadily began assuming responsibilities in projects. "I was the director of projects of Belly Fairing of the A380, of the Falcon F7X or the A330 MRTT and during couple years as BUM in the non-aeronautical engineering sector." In Spain he lived through the business growth at CT, its development of various engineering sectors and the relocation of its offices until finally settling in Getafe.

Is this assignment to CT Ingenieure yet another challenge in a life full of challenges?
It is a change both personally and professionally. It consists of doing what was done in France in 2009 but in a different environment. It is a new culture, a new language and another manner of conducting business. On the family level, my wife and kids have to make changes to their entire life: moving to new country, making new friends, learning a new language. I know it will be pretty difficult for a couple months before we are able to adapt.

What are the sectors and projects that CT Ingenieure is immersed in?
In Germany we have three avenues of development. The first is in Aeronautics where we work in three areas: in northern Germany (Hamburg, Bremen and Stade), with Airbus Civil, in southern Germany, with Airbus Defence and Space, and Airbus Helicopters, and the third, related to the companies and factories of the aeronautic sector and which demand engineering services, like in the case of Premium AEROTEC.
The second avenue of development is in the automotive industry, which is very important in Germany. We hope to have many opportunities although at the same time it is difficult since it is a mature sector. Nevertheless, in the south of Germany we have contacts with Audi, BMW, and more in north with Volkswagen and Mercedes. With Audi, I think the help of Xavi Fernández from Barcelona will allow us to create synergies between Spain and Germany.
Furthermore, we must focus our efforts in finding engineering companies that want to integrate with CT as a method for development within the automotive sector.
Finally, the third avenue of development will be the search for synergies within the rail and energy sector, areas in which we have expertise in and markets in Germany that we can tap into and apply the concept of Nearshore (part of the job done locally and part of the job done remotely from Spain), which we already do for the aeronautical and automotive sector.

Did you imagine that you would have gotten this far when you started?
Absolutely not. When I entered in CT I had just graduated from the university. It was my first job and I did not know anything about the company when I started. Also, the department of aeronautical engineering was just starting in CT. I entered without knowing what I was going to do or how I was going to do it.

How did the move to Toulouse come about?
TIn 2009 we made the move to France crossing the Pyrenees. The experience was both enriching and difficult at the beginning. We decided that CT should have presence outside of Spain (we were only present in Spain and Portugal) due to being selected as an E2S company in 2008 for Airbus Group. We realized that if we want to continue taking part in this list, which renews every two years approximately, and continue growing as a company, one of our obligations was to be present in those countries where Airbus locations were. Given that there is a large Airbus site in Toulouse, we decided that the first office abroad should be there.
In 2009 I began to travel there every week to look for opportunities to develop the business. That summer I moved there with my family. I was there for seven years and it was a very rewarding experience, although I remember that the beginning was difficult. Sometimes, it was frustrating because you would knock on many doors but the business opportunities were scarce. The first contract came in the training area and it was a big surprise.

Any advice you can bestow upon us given your worldly experience?
The key lies in working hard and above all continuing to apply our culture of trust and delegation, which are keys of success of The CT Engineering Group. My managers have trusted me and delegated authority to me during these 18 years and I am completely convinced that these two concepts will be what allow us to keep growing as an organization. ■

index

Country Manager in France

STANISLAS CHOPPIN

Stanislas Choppin recently joined CT Ingenierie as Country Manager. His experience, his forward thinking and his familiarity with the business are just a few of his many qualities. Stanislas joins at an important time as The CT Engineering Group is diversifying its practices to maintain long lasting business relations with clients.

index

How relevant is this new role at The CT Engineering Group for you?
Replacing Francisco Marín after seven years during which he developed CT Ingenierie with great success is definitely a challenge for me. CT Ingenierie is currently working mainly for Airbus Group. In the next three years, the strategy I want to implement relies on diversification: we must be able to have at least 50% of our activity coming from new customers such as STX (marine construction company and services fleets), DCNS (a French defense naval company), Renault, Alstom, GE (an energy group), CEA (French Alternative Energies and Atomic Energy Commission) and CNES (Centre National d'Etudes Spatiales). We also need to work upon developing our activity in Paris and the surrounding area, as well as reinforcing our presence in the west of France.

CT VALUES MUST CONTINUE TO MAKE A DIFFERECE IN A COMPETITIVE ENVIRONMENT

As Country Manager in France, what objectives do you have?
Vicente Egea has given me three objectives to reach. The first one revolves around finding and buying small and mid-sized French engineering companies working for the naval, industry, automotive and railway sectors, ideally located in Paris and in the west of France. The second one consists of working with the French site managers (SMs) and all the French Business Unit Managers (BUMs) to open doors to new customers and being able to start working successfully for them. The last objective is to supervise the three SMs in order to define and coordinate the sales action plan, as well as ensuring all the reporting at The CT Engineering Group level.

What is your experience in CT?
After a few months spent in CT Ingenierie I can say that I have never had, in all my working life, such an easy integration process. While meeting all the CT employees in Spain as well as in France, I noticed they share a real enthusiasm about the CT values. Furthermore, I also feel that they truly understand and believe in the French strategy defined by The CT Engineering Group.

When you came to CT for the first time, did you imagine the growth of the company and your current job?
Most of the European engineering companies have generated growth these past years. For me, the main fact that characterizes CT is the level of satisfaction obtained by our teams in the field working for our customers. Thanks to this high level of satisfaction, CT has succeeded in generating trust and in building long-term relationships with its customers. Our growth is the result of these daily step-by-step relationships built by our BUMs for years with our customers.
As CM France, I must, with the SMs and BUMs, be able to achieve the same result with new customers. This would create opportunities for French CT employees to evolve and develop through new missions, and for our BUMs to recruit new CT employees in these new sectors.

What are the main projects you are involved in and represent the best of your professional skills and personal focus?
First of all, in 2017, we will start working with STX, CT Dinain and CT Ingenierie team at Saint-Nazaire. We will also start our first projects with CEA and CNES. Lastly, we will buy a small or mid-sized French engineering company with a lot of potential.

What are the main values and capacities in CT Ingenierie?
I think the high level of satisfaction we have achieved with our current customers shows that our employees have the potential and customer-focused attitude to bring our company to new heights. The company organization and the values around which CT Group has been built are strong; they have made and must continue to make a difference in an environment as competitive as ever.

Could you give any advice to improve and to manage the engineering tasks to do?
I believe that, in order to keep our level of growth and start working with new customers, the CM and the SMs must meet one new customer every day. Simultaneously, it is important that the BUMs take more of their time to find and recruit some new profiles adapted to our new needs. The securing of new customers as well as of the right talents to fulfill the needs of these customers, will allow CT Ingenierie to achieve its strategy. ■

index

Víctor Máñez and Alejandro Buitrago Chicharro

INSIDE THE DESIGN PROCESS OF AN AUTOMOBILE´S "CPU"

Half a dozen coworkers at the Business Unit Engineering Madrid, of which Ana López leads, have just finished a prototype assembly line design project for Bosch. The prototype assembly line project is for the automatic mounting of an Electric Power Assist Steering (EPAS) system for vehicles, which acts like the CPU control for vehicles.

index

A DECADE OF LOYALTY

Delving into the structure design of the EPAS (Electric Power Assist Steering) of a vehicle is no easy task. It is a maze of complex, interconnected and finely detailed structures. It is a job that requires sophistication, precision and control of pace–qualities that this project and partnership between The CT Engineering Group and Bosch provide. The faithful and effective partnership starting in 2004 has since shared engineering projects for the assembly of all types sensors and vehicle alternators.

Víctor Màñez I Corbella, project manager and customer representative, displays a figure on top of his CPU–the real, physical structure. The figure's green color reminds us of another galaxy. Yoda's presence not only evokes the memory of a film franchise (Star wars) but rather is the implicit manifestation of a working philosophy that permeates the engineering work.

The magnitude of the project that will become "the CPU cars" covers an inventory of 11 different products. The project deals with mechanical complexity: grappling with the dimensions and shapes to reach our goal of cycle time sequencer–the time it takes to get a piece in and out of the machine–. "We are in charge of designing almost 80% of the machines on the test station line," says Víctor.

"If you add the 11 items to the reduced space of the machine and cycle time sequencer, each item takes 15 seconds," says Víctor while hovering his pointer over the 3D image on his computer. Indeed, it is a customized pointer: an axel with a gear, guiding CT Magazine's eyes through the complex functions of the machines.

The engineering design of this project has been performed in 3D with Inventor, a mechanical design software. Each machine consists of several hundred manufacturing parts that are each individually designed. To optimize this process, the machine, small in size (1.5 x 1.5 meters), is divided into 10 subsets that allow them to structure the project and to map out their viability.

"Robert Bosch's testing line has eight machines, and of those we have done six," says Víctor Màñez. This testing line allows any of these machines to mount any of the 11 items available.

Furthermore, the mechanical design work included the realization of a series of tasks: an electrical test that allows each of the machines that form the products to be tested; a series of heat tests in the oven, where they proved that the pieces can tolerate up to two minutes at a temperature of 90 degrees centigrade; a transfer station that moves items from one line to another using two robots; labeling; a pressing test of the connector pins, whose unit of force cannot exceed 0.98 newton; and finally, robotic simulation of eight stations.

"These machines are capable of high quality and high precision manufacturing. In fact, the level of maximum deviation is 0.1mm," says Víctor. Better accuracy than the best Hawk-Eye technology.

The project to design EPAS manufacturing machines began in January 2016 and ended last August. During this period, half a dozen CT employees have been involved and have completed more than 800 hours. A job that has involved both the design of the lines and support customer designers to introduce improvements and cost savings.

"When I joined CT Ingenieros almost 12 years ago I immediately started working with Bosch," recalls Víctor Màñez. During these years he has been the main interlocutor with the customer and has assumed responsibility in project management. During this time he has seen how the map of mechanical design software has changed–an important step for the integration of technology in our workflow. "Leaving Autocad 2D was a useful progression for us. The test required many hours and now with 3D, the time takes four times less than before," he remarks.

The Business Unit Engineering Madrid develops design projects for Bosch in five major areas. The two main areas of activity are the design of USS lines - the parking sensors that are installed on the bumper of the vehicle and the PAS lines for the manufacturing of the airbag door sensor. These fields work together on almost 90% of the projects CT performs with this client.

The remaining three activities include design DESC sensors, sensor for hydraulic automatic gear shift car; alternators, for generating current in the car; and design of pumps gasoline into the tank.

The quality of the engineering, sophistication and competitiveness of the Business Unit in Madrid has lead to established long-term customer relationships and loyalty in our services. As Yoda would say, fixed stoically on the desk: May the Force be with you. ■

index

TWO YEARS WITH CRE100DO AND PROUD TO BE PART OF THE PROGRAM

November 2014 was an important date for The CT Engineering Group, a turning point for further growth in their internationalization process. Valuing the strength, ambition and the near shore model of the company, the Spanish business program Cre100do decided to join us in our transformational process.

Cre100do is not physically present in any business unit, nor is it part of the portfolio of our customers or suppliers. But for two years, they have worked side by side with The CT Engineering Group in the process of development and internationalization.

“Cre100do has opened our eyes and allowed us focus on solutions in our process of transformation and growth,” says Jesús Prieto, president and CEO of The CT Engineering Group. Visible on his desk are papers and documents related to this business program: the best business practices, success stories and new management approaches.

The inclusion of CT in the first group of companies to be chosen in November 2014 was a boost of confidence and pride for a job well done. “It was a surprise,” affirms Jesús and describes the experience as “very positive notoriety that gives us the opportunity to meet other entrepreneurs and executives from dynamic and growing businesses”.

For the last two years, Cre100do has worked with The CT Engineering Group, showing us other forms of management, which has led to the implementation of branding, talent and multiculturalism projects. “This has allowed us to learn new ideas and approaches, especially in business management,” says Vicente Egea, General Manager of The CT Engineering Group.

index

"Internationalization means expanding the ecosystem of the company, which broadens our working environment to a greater diversity of agents. Internally, internationalization implies the integration of new cultures that enrich our company. The challenge is to integrate and act within a shared company culture. This is an important job for the organization but with big results," explains Teresa Saez-Benito, deputy director of Cre100do.

Although there is no magic recipe for big businesses, there are several common ingredients found in all of them. "What we value in a company is an ambition for growth and to reach their potential, with the ability to do so because they are a solid company with committed employees and satisfied clients, a distinctive value proposition, a shared strategic vision and a successful corporate culture of excellence," summarizes Teresa.

It is precisely this aspect that makes the difference between a big company and a great company. "Being a big company means achieving high turnover figures. Being a great company means achieving high levels of excellence. Although the terms are not mutually exclusive, they do not necessarily go hand in hand," says Teresa.

Cre100do explains that The CT Engineering Group was selected because it is an example of a company that has a solid foundation, has ambition and can generate a "drag along" effect for companies in other sectors through its near shoring model and its growth plans, which are based on acquisitions of small specialized companies. "We found their growth plans, based on manufacturing engineering, internationalization and diversification projects, very ambitious and motivating, and we believe that the contribution of CT to the program would be valuable for other Cre-100do companies and other companies in the middle market".

The CT Engineering Group is firmly committed to maintaining its identifying traits (competitiveness, innovation, flexibility and proximity) to develop international projects and new business lines. ■

Cre100do.es
Nuevas Grandes Empresas

Cre100do is a Spanish business program promoted by the Bankinter Innovation Foundation, the Institute for Foreign Trade (ICEX) and the Business Circle. They contribute to the development of Spanish production models to progress them towards models based on more added value, more innovation, more competitiveness and more internationalized performance turning 100 companies in large enterprise models. All companies participating in the Cre100do program turnover between 25 and 250 million euros and belong to different sectors, such as food, technology, fashion, engineering, pharmacy or chemical industry, and are based in 10 different autonomous communities. Cre100do aims to become a meeting point and encourage the exchange of knowledge and experience of the 100 companies participating throughout the five years of the project. This business transformation program will continue to accompany The CT Engineering Group over the next three years. ■

index

INNOVATING THE ELECTRICAL STARTER/ GENERATOR DISCONNECTION SYSTEM AIRCRAFT ENGINES

StaGeDiS is an innovation project developed to complete a conceptual design for a dual-use electrical starter/generator disconnection system to be installed in the main engines of an aircraft.

StaGeDis will establish new conceptual designs for a dual-use starter/generator disconnect system. New generation aircraft require higher level of electrical power, increasing weight and volume of the electrical machines. This R&D project has been created to compensate the growing weight and volume of the necessary equipment that is needed to generate and distribute the electrical energy inside the aircraft. The project works to evolve traditional generators so that they can operate as an electrical starter as well and can eliminate the need for a pneumatic starter system.

The StaGeDis project analyzes, studies and compares the different technology and architecture that can optimize this new system in the aircraft. In doing so, the project seeks solutions to achieve a global reduction in weight and dimensions, an increase in the reliability and security of the system and approaches to make the system more easily maintainable–thus reducing maintenance time and costs. The selected solution will carry out a detailed design, complete with the appropriate definition and methodology for the verification and qualification tests. The project relies on the collaboration and wide experience of Indra for the design of on-board equipment. They have been chosen as a partner due to their comprehensive expertise in the definition of system requirements, system evaluation and system validation.

Due to safety reasons, the starter/generator requires a disconnection system to protect the machines and engine gearbox. This disconnection system shall be able to separate mechanically the gearbox from the starter/generator with the electrical machine operating whether as starter or generator. This system will be commanded by an electrical pulse. Different technologies and architectures will be studied, evaluated and compared in order to define a proper disconnection system. Criteria of weight reduction, compactness and conformity with harsh aeronautic engine environment will be also an important part of the study. The selected solution will require a detailed design and the definition and methodology of the verification tests.

StaGeDis has been co financed by the European Commission through “Clean Sky Joint Undertaking” within the 7º Framework Programme of the European Union. ■

index

R&D PROJECT

DEFACTO – ADDITIVE MANUFACTURING DEVELOPMENT FOR TOPOLOGICAL COMPONENTS

Since 2013, CT Ingenierie has worked in partnership with Stellia Aerospace and Constellium on the former project FAST (Topological Structure for Advanced Forward Section). Last year, Ecole Centrale de Nantes joined the project to further improve the consortium's capability to understand Additive Layer Manufacturing (ALM) applications and limitations.

The DEFACTO project intends to design, develop and manufacture a demonstration of A320 forward fuselage section. The project explores breakthrough design philosophy owing to structural topological optimization. It also aims to democratize and develop ALM technologies for Aluminum alloys. This project is founded by DGAC.

CT Ingenierie committed to this project in order to gather knowledge and develop tools for topological design methodologies. The company is convinced that topological optimization will provide competitive and cost effective design solutions to customers. The benefit of topological approach was demonstrated during the FAST project. FAST optimized crossbeams weighing up to 25% less and are proven to meet the same certification requirements.

The following tasks are required to progress throughout the various design steps and to achieve the successful development of optimized structures.

The conceptual design starts with the loadcase analysis conducted using the Global Finite Element Model (GFEM) related to certification. It allows determining whichever sizing cases are necessary to optimize the structure. Further work is required on the selected ones to ensure no bias can be introduced by the loading application.

The actual optimization is conducted on a Detailed Finite Element Model (DFEM) which includes only the target area. This area is defined as uniform as all coarse elements from GFEM are replaced with small elements. A density ranging from 0 to 1 is assigned to these elements, determining whether they represent void or dense parts of the optimized structure. One of the DFEM specifications is to ensure coherence between DFEM and GFEM loaded nodes. This optimization provides comprehensive material density on the target area which maximizes the stiffness with a constrained average material density.

The load path identified through the optimization are identified as structural stiffeners and sorted depending on their relative size. This stage is called interpretation; it ends the conceptual design phase. The interpretation conclusion is highly dependent on the thresholds selected.

The embodiment design phases shape the stiffeners using parametric optimization. This optimization sizes the stiffeners depending on the hierarchy established in the previous step. The conclusion of the parametric analysis is used to initiate the detailed design phase. ■

Gerhard Marzinik
(Article published in Aerokurier Magazine)

AXTER´S HYBRID AX-40S PLANE. MORE POWER, MORE SAFETY

Increase in power at the start and a fully electric operation in case of failure of the piston engine - that is what AXTER Aerospace promises with the hybrid engine AX-40S.

On the streets hybrid engines are part of everyday life, sparing the environment from carbon dioxide and fine dust. But what use does hybrid propulsion have in aviation? Fine dust and carbon dioxide are not relevant factors.

For the Spanish start-up AXTER Aerospace the safety "plus" that an additional electric drive can offer was the decisive argument to develop a hybrid propulsion for the aviation sector. The first model, the AX-40S with a 30 kW (40 hp) electric motor, developed for the Rotax Motors 912 and 914, provides the test plane, the Sport Aircraft Tecnam P92J equipped with lithium batteries, the option of seven minutes of purely electrical propelled flight. In a previous version for a client, the Technam P2004 with a variable pitch propeller even achieves 12 minutes of electric propelled flight in the event of engine failure.

What is this good for? After having worked for Airbus projects for 8 years, the two founders of AXTER, Miguel Suárez and Daniel Cristóbal, investigated the statistics of aviation accidents before embarking on the venture of hybrid propulsion. The aeronautical engineer Miguel Suárez and the electrical engineer Daniel Cristóbal wanted to improve the sad annual average of 71 deaths in Europe and the USA due to inflight engine failure with their new development. At present the hybrid engine provides the pilots with a little breather after the shock of an engine failure, and enables them to act stress free and gives them time to think.

The Spanish government considered the project worthy of financing and contributed with initial funding. The CT Engineering Group in Madrid-Getafe, which has deep roots in aviation, providing engineering services for Airbus, Dassault and ATR, entered the project as a strategic partner. Jesús Prieto the aeronautic expert and CEO of the 1500 strong company provided AXTER with FEM and structural analysis programmes. The University Carlos III in Madrid contributed with their know how in the design of the power electronics.

The already patented hybrid system of AXTER is the first step towards further and more powerful systems and a final objective of purely electrical propulsion. They now aspire to obtain a licence for Experimentals, Light Sport Aircraft (LSA) and Very Light Aircraft (VLA) and even of airplanes of the categories CS-23 and CS-25. VLAs which have a maximum take-off weight (MTOW) of up to 750 kg shouldn't have a problem with the additional weight of a hybrid system.

The AX-40S was developed as the more manageable entry level variant for the use in the LSA- and Experimental sectors where Rotax motors are very common, and it has now been approved by the Spanish Aviation Authority.

The system can be mounted on four points of the Rotax 912/914. The structure is part of the system. The crankshaft is connected to the electric motor through an automatic working coupling, produced specially for AXTER by Endrax in Slovenia. The electric

index

Daniel Cristóbal and Miguel Suárez, Founders of Axter

motor can be switched on at will and will work decoupled from the piston engine in the case of engine failure. The batteries recharge themselves with the fuel engine, provided that the electric motor was used for the start and initial ascent.

Miguel Suárez demonstrates the use of the AX-40S in Casarrubios del Monte, a popular place for the general aviation scene south west of Madrid, with a 950 metres long asphalt runway. Comparing take offs on the 2050 feet elevation site at 35 degrees Celsius, typical for Spain in the summer, with and without the assistance of the hybrid system, demonstrate the advantages of the e-motor.

In standard conditions, the hybrid engine reduces the take-off distance of the Tecnam P92J with a maximal start weight of 600 kg from 200 to 145 metres. In the high density altitude of Casarrubios the difference is even more noticeable. Unlike the piston engine, the electric motor doesn't lose power in higher density air.

The P92J-Hybrid working entirely electrically still manages to climb 200 feet a minute at a speed of 135 km/h.

The increased performance of the hybrid system at start and initial ascent is more pronounced in Hot-and-High-conditions and on shorter runways (higher grass, sloped runway …). On the other hand, the electric propulsion can be used under standard conditions to reduce the power contribution of the piston engine and thereby diminishing noise emissions. This way, airfields subject to time restrictions in order to reduce noise, could be used again.

The Rotax is switched on again while approaching the runway 26 of Casarrubios. The wildly rugged landscape that can be observed during landing is impressive. Should the piston engine fail here, the hybrid system would allow one to reach the runway securely. In this case it would be too late for the deployment of the BRS, due to the insufficient altitude of the aircraft.

To turn on and connect the electric system one only needs to turn a knob located on the instrument panel, as long as the main switch is already on. The display indicates the most important performance parameters. Various LEDs indicate potential failures.

Large modifications to the equipment of the hybrid system on the P92 weren't necessary. The extra weight of the carrier (0,9 kg), coupling (5 kg) and electric motor (12kg) along with the controller (6 kg) and the batteries (20 kg), which are located behind the seats, compensate each other, thus avoiding the displacement of the centre of gravity. The new position of the propeller, sitting further in the front, didn't turn out to have a negative influence in various different flying configurations.

It took the AXTER system AX-40S 200 hours in test flights to get approved, among them flights from Seville in Andalusia's 45 degrees blazing heat. The air cooling system of the electric motor proved its worth.

The AXTER engineers, with the use of the hybrid engine, have accomplished substantial cost benefits for flying schools. They consist of savings in fuel and maintenance costs by using the Rotax less during taxiing. The electric drive and the coupling are maintenance-free. Hybrid pilots will also be popular with neighbouring residents of airfields since they reduce the emission of carbon dioxide.

The cost of the complete package, which allows an easy montage, is assembled in Getafe and currently costs 18,700 Euros plus taxes and shipping costs. Miguel Suárez explains that this only covers the production costs.

After the development, the certification process and the production set-up, the focus of AXTER Aerospace now lies in the commercialisation of the AX-40S. A second plane is now being equipped for clients. A further two are going to be sent to Cranfield University in Great Britain, where the electric drive will be used for drone research.

In AXTER, further research and development is being pursued in parallel to the commercialisation of the first hybrid package. It's all about developing a completely electric drive and finding further uses for the AX-40S. ■

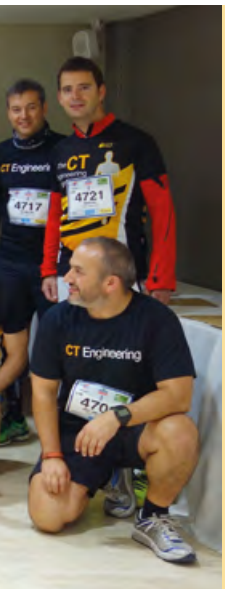
index

David Soriano, Antonio Villar Amador and Alberto Alonso Martínez

David Soriano, Antonio Villar Amador and Alberto Alonso Martínez were part of the winning male team for the six kilometer race –the *Carrera de las Empresas*. Fifty coworkers from CT Ingenieros took part in the race that weaved its way through the heart of the Spanish capital.

CT INGENIEROS WINS "CARRERA DE LAS EMPRESAS" 6KM RACE IN MADRID

GOALS ARE NOR JUST FOR RECALLING AND LEAVING BEHIND, RATHER THEY ARE THE START OF A NEXT STEP



Excellent results never appear spontaneously, nor do they come out of nothing. Tenacity, effort and courage are essential ingredients that accompany success, whether they be work, sport or life in general. All personal and professional growth is born of conviction. It is self-motivation which unites all of our abilities in order to overcome obstacles, improve ourselves every day and become motivated to accomplish our goals.

More than fifty coworkers from CT Ingenieros geared up to participate in the race on December 13, 2015. The cold morning came to life with the starting gun which began the race they had spent months preparing for. Six or ten kilometers ahead of them, through the emblematic streets of Madrid, such as the Paseo de la Castellana, and Plaza Colón, the square that is named after the tenacious conqueror Christopher Columbus.

Three of them stepped up to first place: Alberto Alonso, David Soriano and Antonio Villar. The team had won in the men's category for the 6 kilometer race. "We had said goodbye and I was already leaving. Then I saw the rankings, and I quickly sent a Whatsapp and a photo of it," recalls Antonio Villar, an employee in the Systems team, when he realized they had just got first place. "I couldn't believe it, I thought it was a joke," says David Soriano, employee in the Stress department, when he read the text. The official announcement arrived a few hours after 'the third stage' was finishing.

It all started when Antonio, David and Alberto, from Customer Services, met at la Carrera de la Ciencia (Race for Science). There was a good synergy and Antonio found out that in previous years the six kilometer races had been "achievable". "I wanted to try and to see how it would go for me," he explains. So he got to work and convinced David and Alberto to do the same.

They, along with the rest of their coworkers, took part in their first trials a few months before, applying patience, effort and tenacity to each day of their training. During the previous months they did extensive physical as well as technical training, because "running, although it seems simple, requires a certain technique to avoid injuries," Jorge Fuente, design engineer at CT Ingenieros, tells the CT Magazine.

He was in charge of preparing a training plan for his colleagues. Qualities such as technical knowledge and dedication were not unknown to him. "I started doing track and field in 2000 and continued to 2012. It was hard training, six days a week, I shared the field with an athlete that had participated in the Olympics," he tells us. There were a few months where the Cerro de los Ángeles (Getafe) had transformed into the epicenter of a training philosophy: running is a gift, and you get what you put into it.

The race has ended but its goals remain. Goals are not just for recalling and leaving behind, rather they are the start of a next step, which allows us to apply the training we worked for to tackle new and important challenges. Well done to everyone in the CT team for taking part! ■

index

JAVIER MOLINA

CT Magazine interviews Javier Molina after finishing the Ironman 70.3 in Mallorca. An Ironman 70.3, also known as a Half Ironman, is one of a series of long distance triathlon races organized by the World Triathlon Corporation (WTC). The "70.3" refers to the total distance in miles (113.0 km) covered in the race, consisting of a 1.2-mile (1.9 km) swim, a 56-mile (90 km) bike ride and a 13.1-mile (21.1 km) run. Each distance of the swim, bike, and run segments is half the distance of that segment in an Ironman triathlon. The event location, Alcudia, is one of the most celebrated towns in Mallorca, with more than 30 km of the coastline made up of gorgeous, fine sand beaches, steep cliffs and secluded coves of great beauty.

What types of challenges did Ironman Mallorca 70.3 entail?
For me, the challenge of entering the world of the triathlon was an endurance test. It involved as much completing the race as it did training in a completely different way than I had ever done before. Running is something that I am more or less accustomed to, but, although I participated in the Sertri (triathlon in Madrid) a couple of years ago, I had not trained for swimming or biking before. Preparing these three disciplines at the same time was something new, and moreover we started training in January, which didn't give us much time.

What type of preparation do you have to do for an Ironman like the one in Mallorca, on a physical and a mental level?
Since we started preparing for it, we tried to go swimming and running two days per week and at least take one day to do some biking–at home on a machine when there was bad weather, or on the weekends for a longer ride when the weather permitted. With regards to the psychological preparation, I am not very mentally strong, so I simply tried to suffer through the training in order to not have any surprises during the day of the race. During all the sessions in the pool of the last month I was covering the distance of the race, and for cycling I trained both the distance and the climbing portion a couple times. Training to make sure I could do something like this, having already done something similar before, is what allows me to face new challenges with confidence.

Did you make any changes (to your calendar, training, sleep or nutrition schedule) to progress faster for the race?
As we approached the race, the last month we intensified the training a bit in the sense of not missing any day if possible. For this we had to adapt our work schedule a bit and reduce our free time. But other than that I did not make any major changes. My nutritional plan did not change, I just tried to sleep more during the preliminary weeks to recover a little better. The week before the race, yes, we rested and did not train. Better go to the race a bit under trained than to go tired.

TRAINING IS WHAT ALLOWS ME TO FACE NEW CHALLENGES WITH CONFIDENCE

index

How were the weather conditions in Mallorca? Did you expect them as such?

Well the weather was our main obstacle: we had rain, wind, cold temperatures... We expected that with both the time of year and the place of the race we would have good weather. And in fact we actually took some vacation days to relax on the beach after the race. But the week before the race, the forecasts warned of bad weather and it worsened as the date approached.

Precisely because we did not expect it, we did not go very equipped for those conditions. Personally, I worried about the biking part since I had never trained in the rain, and the downhill parts during the mountain sections of the race troubled me. Luckily in the end the conditions were eased a little. We got cold waiting before the start, and rain did not stop from the time we left the apartment until we returned. But in the end the conditions turned out to be nothing more than discomfort.

All that remained was to sleep, get up early and get going, how was the morning pre-race?

I was expecting not to sleep well before the race due to nerves, but the truth is I rested like any other day. The only drawback was that we did not sleep much that night. I was up at 5:00 am for breakfast and to get prepared, and then suddenly we were hit with the bucket of cold water that was to go outside and feel the rain that was pouring. Getting up was difficult of course, but the nerves wake you up quickly.

How would you describe your adventure in the race?

The worst part was waiting at the starting area. For the swimming part, people had to go in groups according to a set time. So until we started we spent 40 minutes in the rain and cold despite wearing a wetsuit. Swimming is what I performed the worse at, but the truth is that I did better than I expected, probably because of the help of wetsuit. The main complication for me was that there were many jellyfish, small and widely dispersed, so you could not avoid them or ignore them. One of them stung me in the face, but it was very little compared with bites suffered by some of the other competitors.

The bike section of the race had an ascent to the port, a descent and a flat stretch. The three parts are more or less similar in distance. The climb went pretty well, I even got ahead of some people. The same happened during the descent, because everybody was afraid of falling in the rain. It was during the flat stretch where I lost the ground that I had previously gained. In addition, the speedometer had been damaged by rain and I had no reference of time. This stretch took me a bit longer to do, and I regretted not having done more long rides in training, but I ended up keeping it together well.

The run was the part where I had to suffer. The first third I did very comfortably, but by the 8th kilometer the bike part had taken a toll on me and my legs began to ache considerably. The last lap felt like eternity, but at a slower pace I managed to finish it. There were also many people cheering and that always helps.

Your final time was.....? Are you content with the result?

It took me about 6 hours and 35 minutes to complete. My goal was to finish, so my time, taking into account the weather conditions, strikes me as a good result and was more or less what I expected. Finishing in 6 hours or less would have been a very good time for me. Personally upon finishing a race of this type I always leave thinking I could have pushed myself a little harder at some point in the race, or that some aspect of my performance needed to be trained a little more... So I really never leave 100% satisfied since I always know I could have done a little better. But given that it was my first triathlon, and considering how I had trained and the weather conditions, I'm happy with the result.

What are your next challenges?

So far I have not thought of any new challenges to embark upon. I imagine that when someone does a half Ironman the first thing that comes to mind is to do a full Ironman. But that is something I do not see in my reach, at least for now. For now, my only certain goal is to not stop training. I may slightly reduce the intensity of my workouts, but I will keep training and try to reduce my running times, for the 10km to a marathon. For me it is not so important to train for a massive goal as it is to be prepared to sign up for whatever arises, whether it is a game of paddle or a triathlon. Of course, if there is group that wishes to prepare for another half Ironman in the future, I will be there, and try my hardest to beat my previous race time.

You are now an Ironman finisher. What is your advice to triathletes who want to compete in Ironman?

I do not know if I'm qualified to give advice, because I believe I have strayed considerably from what a real athlete or a coach would recommend. Simply put, they should try. And if they can train with people, the preparation goes much easier. I imagine that someone who would be interested in this type of race already has a workout routine, so it is only taking that one step further. It will be difficult more or less, but if I could do it, any regular triathlete can. ■

index

MISSION ACCOMPLISHED: GUILLERMO PORRERO COMPLETES VILLACAÑAS DUATHLON

Our workmate Guillermo Porrero participated in the IV Duathlon Cross in the Spanish municipal of Villacañas (Toledo).

Guillermo Porrero is “content” after finishing the fourth Duathlon Cross Villacañas (Toledo, Spain) for beating his time of the last year’s edition. “Mission accomplished”, he says proudly. And no wonder, because Villacañas is his hometown. The duathlon was held on September 11 and had a distance of 27.5 kilometers (5 km race walk, 20 km mountain bike and 2.5km run) in which more than 100 athletes participated.

The terrain of Villacañas, being located on the side of the mountain, leaves little room for a flat course design. “The race had a constant slope of about between 4% and 5%. It’s an up and down knee breaker route which also had a lot of wind blowing so we had descend using drafting [the technique of following each other to reduce wind resistance]” says Guillermo Porrero.

His love of the sport began in high school where he joined a track and field team, competing in cross country events as well as within stadiums. His aeronautical engineering studies in Madrid forced him to stop, but when he graduated, he reprised his love of the sport along with his brother. “It was five or six years ago when I started competing in open races around Madrid, such as the Saint Silvester, and from then I began to go much harder with my bike,” recalls Guillermo.

The cross-country Duathlon in Villacañas attracts registrants and fans in each edition. “Each year more and more people are excited to come, and every time there is more of an audience. The atmosphere is fun and enthusiasm of the public motivates you,” he says. It was a weekend full of sports activities and time to enjoy the company of friends. “I did not run alone; rather I encouraged some friends to stay for the weekend and to run with me.” All in all, a fantastic weekend in the heart of La Mancha. ■

index

CT EMPLOYEES COMMITMENT TO SOCIETY

The board of directors of The CT Engineering Group has supported two volunteer projects promoted by CT employees, showing their commitment to fostering these types of initiatives and strengthening their sense of corporate social responsibility.

Two volunteer projects were discussed by the board of directors at The CT Engineering Group. The first consists of developing a Maintenance Drip Irrigation System in Nariokotome, a remote region in Turkana (northern Kenya) where the majority of the population is illiterate. For this reason the design of graphic and visual manuals will allow them to be self-sufficient in maintaining the system.

The second project consists of donating computer equipment to a community in Inharrime (Mozambique) in collaboration with the NGO "Friends of Inharrime." The goal is that these computers are used as education tools that break the circle of poverty in which the community lives.

During the last CT board meeting, it was agreed to support these volunteering actions and to encourage corporate social responsibility actions. The board maintained the objective is to "get the voluntary commitment of people from the company that are interested in dedicating part of their time to social causes."

Volunteer projects should be sustainable and, where possible, be related with the activities of The CT Engineering Group. The decision of participating in a project must be completely free, voluntary and coordinated/directed by the participants of the project. All volunteer projects will be analyzed by the board and will be supported financially by them if necessary. ■

index

Joan Font, Jesús Prieto and Vicente Egea

JESÚS PRIETO RECEIVES AN AWARD FROM THE ALUMNI ASSOCIATION ETSII – UPM

THE PANNEL HIGHLIGHTED THE ENTREPENEURIAL ATTITUDE

The Alumni Association ETSII-UPM recognized Jesús Prieto, president of The CT Engineering Group, with the award 'Entrepreneurial Industrial Engineer'. The award from the Alumni Association recognizes the excellent work Jesús has carried out in Engineering Consulting services. The panel highlighted the entrepreneurial attitude that is required to convert The CT Engineering Group into a reference company for product design engineering, manufacturing and after-sales support. Carlos Mira, president and founder of Cre100do and in charge of presenting the award, emphasized "the company possesses the capacity to identify opportunities to differentiate themselves from the competition and to contribute value to clients as well as employees."

Jesús accepted the award and maintained, "I must share this privilege with all of those who have supported me throughout these years to build The CT Engineering Group." During his speech he elaborated on the importance of being surrounded by a such a great team in order to turn the company into a reference within the industrial sector. Today, The CT Engineering Group has 1,497 employees, operates in four continents and made 115 million euros this year.

The seventh edition of these awards took place in the headquarters of 'The School of Industrial Engineering' (Escuela Técnica Superior de Ingenieros Industriales – ETSII) which has become a professional meeting place where many generations of alumni and professors from the school gather. The awards were headed by the chancellor of the Technical University of Madrid (UPM), Guillermo Cisneros, and by the director of The School of Industrial Engineering (ETSII), Emilio Mínguez. ■

CT INGENIEROS RANKED 50TH ON THE LIST OF THE TOP 100 "BEST COMPANIES TO WORK" IN SPAIN

This ranking motivates us to continue our process of growth and internationalization, remaining loyal to our goals and our corporate philosophy: CT, a place where engineers love to work.

The finance magazine Actualidad Económica has published its annual ranking with the best 100 companies to work for in Spain. CT Ingenieros came in at 50 and is the first company dedicated to engineering services to appear on the list. This ranking evaluates multinational companies and other big companies on merits such as good working practices, labor relations and corporate responsibility.

Independent evaluators valued the good work environment at CT Ingenieros and admired the care and attention to "training and employee development" that CT provides. The evaluators also appreciated CT´s internal communication tool: "CT, Innovation & Improvement Ideas", renamed, after the new design of the corporative intranet CT Insider, as "Share your ideas for CT". This tool allows all workers to be able to share their ideas with all corporate departments.

The evaluation methodology measured six categories: talent management, payment and salary, work conditions, corporate social responsibility, training and employees. This ranking motivates us to continue our process of growth and internationalization, remaining loyal to our goals and our corporate philosophy: CT, *a place where engineers love to work.* ■

CT AEROCOMP BECOMES CT ENGINEERING GROUP UK AND OPENS NEW OFFICE

CT Aerocomp has opened a new office and changed its name to CT engineering group UK.

Due to this change our brand image remains consistent and reflects the unity of the entire group. The office in Bristol (Bristol and Bath Science Park, Dirac Crescent, Emmerson Green) allows it to be closer to customers in a building that is exclusively designed for engineering and science companies.

Currently the CT Engineering group UK has 16 engineers spread across Airbus R&T, National Composite Centre, Airbus F&DT, Training and research and development.

The CT Engineering group UK specializes in design & analysis of composites and manufacturing support and training for all areas of engineering. It also has an ongoing UK research project looking at automatic ultrasonic welding of thermoplastics. ■

CT INGENIEROS SIGNS ITS FIRST NEARSHORING CONTRACT WITH ASAP ENGINEERING

The client, Automotive System And Projects (ASAP), is present in nine locations and employs 1,000 people. Using its expertise and know-how ASAP is constantly widening new technological fields and providing innovative solutions.

The mission of this first in-house project is to design the harness for all C-BEV electrical vehicle components for Audi. Reaching this milestone, CT Ingenieros de Catalunya achieves one of the goals set in its Strategic Expansion Plan. ■

ASAP ENGINEERING

CT IS RESPONSIBLE FOR BIM MODELS OF THE LARGEST SHOPPING MALL IN ANDALUSIA

CT AEC (Architecture, Engineering and Construction) is responsible for the quality of the BIM models of the largest shopping mall in Andalusia (Torremolinos, Málaga). The project is expected to reach a total investment of 1,200 million euros.

Building information modeling (BIM) is a process involving the generation and management of digital representations of physical and functional characteristics of places. Building information models (BIMs) are files (often but not always in proprietary formats and containing proprietary data) which can be extracted, exchanged or networked to support decision-making regarding a building or other built asset. Current BIM software is used by individuals, businesses and government agencies who plan, design, construct, operate and maintain diverse physical infrastructures, such as water, wastewater, electricity, gas, refuse and communication utilities, roads, bridges, ports and tunnels.

In addition, CT AEC is involved in the structures for the new Palace of Justice in Paris, designed by Renzo Piano, one of the best architects in the world. ■

SPAIN - FRANCE - GEMANY - UNITED KINGDOM - UNITED STATES - BRAZIL - PORTUGAL - INDIA

index