The dynamics of growth and development of the Mexican Aerospace Industry, has placed our country on track to become an international leader of this industry. Mexico has forged its advantages building the future to establish itself as a center for advanced manufacturing, engineering, design and development of strategic value added for the Global Aerospace Industry.

From a national perspective this sector is considered strategic for its growth potential, its contribution to technological development, competitiveness and its high sophistication in their exports, that reached 6,686 million dollars in 2015, a 5% increase from the previous year. The growth of the Mexican Aerospace Industry has been unprecedented, especially during the last twelve years that have seen a compounded annual growth rate of nearly 20% in exports, climbing from around 60 companies to more than 300 companies and support entities that currently make up this sector, NADCAP and AS9100 certified employing over 45,000 high-level professionals.

ProMéxico as part of the next stage of development of the aerospace and defense industry in Mexico, defined the need to establish regional strategies to identify and drive the development of productive advantages for the aerospace clusters in the country.

These strategies seek the development of poles of competitiveness; ie: innovation ecosystems and high-level coordination to raise the competitiveness of all regions, harmoniously combining different sectors, encouraging innovation, efficiently using resources, increasing collaboration, productivity and competition.

By promoting competitiveness clusters, companies will have advantages in terms of access to a broader supplier base, specialized support services, sources of talent, access to knowledge, technologies, human resources and markets among others, attracting similar and complementary companies. In addition to local benefits, the said poles facilitate the efficient integration into production with strong national and international innovation networks.

Under this criteria, this report will allow us to continue this strategy and support the development of the sector. We invite you to take the time to read through this work and learn about the Competitive and Strategic Mexican Aerospace Industry.
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This research has been conducted by Gabriel Mark, James Hogan, Ty Anderson, Joseph Maddison, José Pérez, Juan Pablo Guzmán, Agustín de Cauza, and Margarita Smith.

Editorial Credits
Image: © Getty Images

Global Business Reports’ journalists provide on-the-ground analysis of the trends that are shaping Mexico’s aerospace industry.
“In 2005 there were 61 aerospace companies established in Mexico. Today, one decade later, more than 300 companies and agencies make up the sector. The consolidation of Mexico as an important investment destination and as a platform for development in this industry has been possible thanks to the efforts of our triple propeller: government, academia and industry.”

- Francisco N. González Díaz, CEO, ProMéxico
Mexico has the second largest population and third largest land area in Latin America and is situated to the south of the United States, with which it shares a 3,200-km (1,990-mile) border. Since the implementation of the North American Free Trade Agreement in 1994, the U.S. and Mexican economies have grown at similar rates and patterns. In 2014, over 80% of Mexican exports were to the United States, with which it shares a 3,200-km border. Mexico is the north/easternmost country in Latin America and third largest land area in Latin America. It is bordered by the United States, the Pacific Ocean to the south and west, and the Caribbean Sea and Gulf of Mexico to the east.

From the Congressional Research Service, 2014, over 80% of Mexican exports were to the United States, with which it shares a 3,200-km border. Mexico is the north/easternmost country in Latin America and third largest land area in Latin America. It is bordered by the United States, the Pacific Ocean to the south and west, and the Caribbean Sea and Gulf of Mexico to the east.

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Exports:
$434.8 billion (2015 est.): metalworking goods, oil and oil products, silver, fruits, vegetables, chemicals, iron and steel, iron and steel vehicles, planes and parts, machinery and parts thereof, electrical and nonelectrical equipment, electronics, electronic components, televisions, computers and parts, optical and photographic equipment, watches, clocks and parts, and other nonelectrical machinery.

Imports:
34.1% industry, 62.4% services (2015 est.)

GDP per Capita:
$18,500 (2015 est.)

GDP:
$1.964,375 sq km

Official Language:
Spanish

GDP Growth Rate:
2.3% (2015 est.)

Naturalized since 1938.

Francisco N. González Díaz

CEO

PROMÉXICO

Can you provide a brief overview of ProMéxico’s role in the promotion of the Mexican aerospace industry?

The sustained growth of the Mexican aerospace industry is the result of the coordination of industry, academia, and government. This triple helix has built a collective vision of the future of this sector, establishing multiple actions to develop and promote its competitiveness. From this vision, ProMéxico, in coordination with key players, created and orchestrated in 2010 a comprehensive plan called National Plan of Flight (PVN), which has been the basis for developing the national strategy of Mexican aerospace (ProAero). The PVN is the point of reflection and assessment that refines the strategy defined in the previous years, considering the developments and evaluating results for its tactical and operational implementation.

Now in its fifth version, the PVN presents the result of projects and lines of action proposed since its inception, including a prospective analysis of global trends in aerospace and defense, with particular emphasis on the implications for Mexico. Finally, points are the regional strategies of the main aerospace cluster in the country. The results collected in this publication have materialized from the proposals of the first versions of the PVN. As may be noted, it has been shown how various actors can coordinate the Mexican aerospace industry in order to trigger their growth and increase their added value.

This year we celebrated together the first Mexican Aerospace Fair, which was attended by 190 companies from 11 different countries. The success of this first edition confirms the strength of the Mexican aerospace sector around the globe. Our country reaches higher altitudes every day. Proof of this are the results obtained in the last years in the aerospace sector and its growing success. Today, as never before, Mexico flies high and with wings of its own.

Can you talk about some of the main qualities Mexico offers today to encourage international investment into the aerospace industry?

Mexico is a country that is flying high in the aerospace industry. This is possible thanks to our experience in high-tech sectors, our proximity to the United States—the most important market in the world—our infrastructure and major transport and logistics networks, having joined the Wassenaar Arrangement and, above all, our talent and human capital. These competitive advantages have enabled the operations of major aerospace companies in Mexico. Some relevant figures demonstrate our success: at the beginning of the 21st century, our aerospace exports were almost zero. In 2014 we exported over 6.3 billion dollars. Another fact illustrates our growth, in 2005 there were 61 aerospace companies established in Mexico. Today, more than 300 companies and agencies make up the sector. The consolidation of Mexico as an important investment destination and as a platform for development in this industry has been possible thanks to the efforts of our triple propeller: government, academia and industry.

Mexico’s aerospace industry has grown 17.2% annually for the past nine years. Can you talk about some of the key drivers for this growth?

Major international companies like Bombardier, Safran Group, GE, Honeywell and Eurocopter have found in Mexico the conditions to develop design and engineering centers, laboratories and production lines capable of evolving quickly to handle more complex assignments in the race for next generation engines and airframe components. This has been possible due to the wealth and availability of specialized human capital. Mexico is the most important talent pool in America, with more than 100,000 graduates per year from engineering and technology courses. In addition to new graduates, Mexico has highly qualified personnel with decades of experience in the automotive, electronics, medical devices and advanced manufacturing-related industries. The overall quality of infrastructure has also played a major role in creating conditions that are favorable with the availability of laboratories, certification units and the presence of Mexican civil aviation authorities.

This facilitated the signing of the Bilateral Aviation Safety Agreement (BASA) with the United States Federal Aviation Administration, which involves the recognition by the United States government of aeronautical certification systems and products made in Mexico. This allows components to be designed and manufactured in the country and encourages the development and strengthening of national procurement for the parts manufacturing industry.

What initiatives does ProMéxico have to accelerate the country’s ascent in the production ladder?

In order to support the development of the industry and to encourage innovation and the value-added activities, ProMéxico is supporting this industry in two strategic areas: developing exports and attracting foreign direct investment. In order to promote exports, ProMéxico organizes Mexican Pavilions every year at the major international trade shows, buyer missions, business encounters, and other events. This year, a Mexican Pavilion was installed at the International Paris Air Show at the Paris-Le Bourget Airport, with a significant number of Mexican companies. ProMéxico held a seminar on issues of foreign investment with FEMA at the first edition of the Aerospace Fair Mexico 2015, organized recently by the Mexican Air Force (FAM). Moreover, at the initiative of Boeing, a seminar was organized under the First Forum of International Procurement that this year we celebrated together the first Mexican Aerospace Fair, which was attended by 190 companies from 11 different countries. The success of this first edition confirms the strength of the Mexican aerospace sector around the globe. Our country reaches higher altitudes every day. Proof of this are the results obtained in the last years in the aerospace sector and its growing success. Today, as never before, Mexico flies high and with wings of its own.
Can you talk about the efforts that FEMIA is making to grow the local network of small and medium-sized enterprises (SMEs) supporting the aerospace industry and ensuring that corporations have access to the supplies they need?

FEMIA is currently developing and monitoring a system, which takes an inventory of the companies in the sector as well as the kinds of skills and capabilities that they possess, and matching them with the requirements of other companies.

The aerospace industry in Mexico resembles an inverted pyramid, in that there are many original equipment manufacturers but a shortage of local suppliers. What is causing this and what is the solution?

This inverted pyramid is not a long-term trend but a snapshot of the current landscape of aerospace in Mexico. The development of a supply chain is an ongoing process, and the aerospace sector in Mexico is fairly young. We have some very important companies that are present in Mexico and we recognize the need to develop the rest of the supply chain pyramid adequately—but this is all part of a process, within which we are trying to accelerate this progression through developing the companies that have the proper skills to sustain the integration of the supply chain. At the top, there are technologies that are not available in Mexico, so we are required to invite companies to come to operate in Mexico to supply the North American market.

How does FEMIA link academia to industry?

We serve as the linkage point between academic institutions and companies, by actively working to fill the gaps in academic identification by companies’ requirements. For example, we have a close relationship with the Mexican Aerospace Education Council, which is an organization that groups some of the major educational institutions. Furthermore, we recognize that this is one of the most important factors for the future of the industry in Mexico.

Companies have identified a lack of skilled labor. Has this also been identified by FEMIA?

This is another example of the process that FEMIA is undertaking. To curtail this issue, we are promoting technical level educational institutions in the areas in which industry has identified as lacking.

What are some of the areas for lobbying that FEMIA is involved?

We are working with the Ministry of Economy in Mexico and ProMéxico to jointly promote Mexico’s aerospace industry. We are working as one entity so we might coordinate all of our efforts together to employ a more efficient and clear message. Another example is the Mexican Aerospace Show that we work jointly with Mexico’s Air Force in order to promote and organize, in which 250 exhibitors participated in the first year and for the 2017 show expect close to 500 exhibitors.

What is FEMIA’s strategy for achieving its goal of 400 foreign companies in Mexico, and some of potential challenges?

FEMIA is very optimistic about the future, but we are aware of some of the challenges we might encounter. The first one is to consolidate the integration of the supply chain as we see this as only a Mexican aerospace industry market and would like to consolidate the supply chain as a platform for North America. The second challenge is to fulfill the human capital requirements with the growth of the aerospace industry, which is why we work closely with academic institutions.

Do you have a final message for the international aerospace community?

The first message is to Mexican companies who are looking to participate within the industry, and that is to engage in their due diligence and learn about the industry in order to understand what is necessary for them to achieve their goals. To the international community, we want them to get to know Mexico beyond the headlines. Mexico has much to offer to foreign companies that can benefit the growth of the aerospace industry in Mexico. *

Contrastingly, Chihuahua’s aerospace cluster is relatively new and highly centralized around the capital, Chihuahua City. In addition to housing five of the seven original equipment manufacturers (OEMs) in Mexico—Cessna, Beechcraft, Textron International, Honeywell aerospace, and EZ Air Interior Ltd.—the state’s capabilities range from interiors, in emergency evacuation systems, to aerostructure assembly for aircraft and helicopters. The government is working to implement a multifaceted maintenance, repair and overhaul (MRO) plan, with hopes of eventually having a final assembly plant in Chihuahua. Though timelines are highly dependent on the industry, airplane painting and parking centers are expected to be added to Chihuahua’s international airport by the end of 2016.

Nuevo León is one of Mexico’s industrial hubs, and the city of Monterrey boasts a rich history in the steel, cement and glass industries. These markets are dominated by large, family-owned Mexican companies that in recent years have identified the opportunities offered by the aerospace industry and have undertaken a strategy of...
diversification. Today 80% of the companies with operations in the aerospace industry in Monterrey are Mexican-owned companies. One exception is the state’s only OEM, Monterrey Aerospace, which is a wholly owned subsidiary of MD Helicopters. Nuevo León has a specialization in metal mechanics and offers strong testing capabilities through companies such as Esoma and Grupo Forem. Monterrey is also home to a competitive MRO market, which is developing its specialties in parts for fuselage, landing gear, cables, harnesses and precision machining, and the joint venture between AeroMéxico and Delta Airlines led to the 2014 inauguration of TechOps MRO—Latin America’s largest MRO. The opening of the Aerospace University in Querétaro (UNAQ) further reinforces Querétaro’s reputation of the strongest emerging cluster in Mexico. While Sonora is typically known for mining as well as automotive manufacturing and other maquiladoras, the state’s tri-city aerospace cluster, comprised of Hermosillo, Guaymas and Empalme, is helping to shift the state’s industrial profile. Sonora is characterized by aerospace companies that are focused on precision machining, electromechanical assembly and sophisticated processes. Still growing and working through a lack of sufficient suppliers, Sonora nonetheless claims the title as the largest cluster of precision-machining and engine-component companies in Mexico. The central focus of our research across Mexico’s five aerospace clusters is on the development of the supply chain. In Baja California, the industry has reached a point where there are too few suppliers to absorb continued growth and, as such, the state is facing an inverted pyramid problem. The Tijuana and Mexicali clusters in Baja California are focused on developing providers of special processes such as heat-treatment and non-destructive testing, for which contractors still look abroad. In Querétaro, there is a lack of machine shops and access to raw materials. This report aims to describe how the industry is overcoming the challenges of building a sustainable local supply chain, challenges that are rooted in the difficulty of certification, a lack of qualified skilled labor, and restricted access to capital. Towards the end of the book, we have highlighted the special case of La Laguna, a region in northern Mexico that is developing local suppliers to solve some of the pressing issues listed above as national concerns. We would especially like to thank our partners, ProMéxico and FEMIA, for their continued support and show our gratitude to the local governments for their assistance throughout our project.
Can you provide more detail on the type of aerospace clients in Mexico?

One of EY’s clients is one of the biggest manufacturers in Chihuahua and it exports a significant amount of its production, meaning it has significant global trade concerns. Nearly 100% of the raw materials, such as high-grade aluminum and metals, have to be imported as they are not produced in Mexico. As such, the process of importing raw materials for manufacturing, and then exporting the final product is not easy for the company. EY works closely with them to have the right systems in place that also comply with the Mexican authorities. With regards to specialized taxation when operating a maquiladora, several issues arise that could have implications on a company’s tax structure in Mexico, including ensuring that the operating model complies with permanent establishment exceptions, transfer pricing, and human capital.

How do foreign aerospace companies evaluate opportunities in Mexico differently from foreign companies in other industries?

The aerospace sector looks at investment in a whole different spectrum than other companies and foreign aerospace companies are looking to enter the country. Most investments in Mexico are created with a strategy to reduce costs by taking advantage of the federal programs like maquiladoras, IMMEX, or VAT certification. Aerospace, on the contrary, does not really consider those aspects until the very end. The crucial points they focus on relates to operational elements, including the supply chain and labor force. Mexico is not the cheapest workforce in the world, so companies do not focus solely on the hourly wage, but also on the productivity of the workforce and the company as a whole. Additionally, there is a vast amount of products crossing borders that ends up being a heavy burden on companies if they do not have the right expertise and systems in place. To support its clients EY’s team of experts assists with inventory tracking, VAT returns, global-trade compliance and data analytics, which is crucial for efficient lead times.

Can you provide us with an example of the type of work EY performs for aerospace clients in Mexico?

You mentioned employees are very loyal, but what does the aerospace sector believe the workforce lacks?

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Aerospace in Mexico is still in its infancy. We have significant clients doing very specialized manufacturing. Mexico is open to see the rise of all the support industries that are necessary for these big companies, like specialized recruiting firms or sourcing consultants for the aerospace industry. Whereas in specialized countries there are firms dedicated 100% to these efforts. The same thing holds true in logistics and transportation, which leads to the big companies taking the burden of doing it themselves. If Mexico wants to take a leading role in the aerospace industry, it will have to consider those aspects until the very end.

You mentioned that plant managers are very protective of them. Can you provide more detail on the type of work EY performs for aerospace clients in Mexico?

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AEROSPACE SURVEY DATA ANALYSIS

IN COMPARISON TO OTHER SECTORS, DEVELOPING THE AEROSPACE INDUSTRY IS CRITICAL FOR THE ECONOMIC GROWTH OF MY REGION

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AEROSPACE SURVEY DATA ANALYSIS

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DO YOU THINK THE TRIPLE HELIX MODEL IS EFFECTIVE NATIONALLY

75.8% of respondents agree that it is likely all aircraft parts will be assembled in Mexico within the next ten years

Industry Explorations

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FACTSHEET
through long-term leases. It is common for foreign companies not to invest directly in infrastructure. The trend and aim of these foreign original equipment manufacturers (OEMs) is to build their surroundings with local suppliers and providers, and this vertical integration is precisely what Mexico needs. Our primary goal as a development bank is not to directly finance OEMs and tier-one companies, which usually come from Europe or the United States with cheaper credit from home or the international market financing in various stock exchanges, but to foster the development of the local tier-two and tier-three base of both domestic and foreign companies. EM: Bancomext also offers airlines structured financing so that they can purchase ships and increase and modernize their fleet. Mexico’s growth in aviation has become quite significant over the years, showing very optimistic signs when compared to the rest of the world, both in expanding the fleet and remodelling and modernizing the current fleet.

How have shelter schemes been key for the development of the aerospace sector in Mexico?

FHU: Mexico has a unique way of working with the big, international OEMs through shelter schemes. Shelter schemes can offer certain benefits for companies looking to invest into Mexico, like needing to make capital investments, nor hiring personnel, nor creating a legal company structure. On the contrary, these companies connect with various commercial real estate developers who take care of topics like finding the specialized technical personnel, importing the raw materials, and all these types of processes, allowing the OEMs to focus on their operations while these sheltering companies take care of administrative and legal aspects. Bancomext helps finance these sheltering companies.

What opportunities does the aviation industry represent for Mexico?

FHU: In Mexico, the aviation story is now a modern and young one, whereas in Latin America only four airlines control around 60% of the market, in Mexico the market has a large component of fairly new airlines that started off as small niche players, but have grown significantly and increased competition in the market. When comparing Mexico with Latin America, Mexico has grown in the last three years in terms of passenger numbers by over 10% to 13% per annum, translating into investments in fleet growth and modernization of all Mexican airlines. The consumers have benefited incrementally as the prices keep dropping as a result of increased competition.

All these factors are driving growth, which translates to airlines renovating or changing their fleet, which is a major trend seen mainly in Asia Pacific, China, and the Middle East, like Kuwait and Saudi Arabia. OEMs currently have orders that are up to their capacity for the next eight years, meaning that if a Mexican company wants to buy a airplane, it must buy them years in advance, and must solicit financing from institutions like Bancomext in order to secure it.

Mexico, furthermore, has an even greater opportunity not only in aviation but especially in the maintenance, repair and overhaul sector, since Mexico becomes a hub for Latin America to North America as well as the whole world, not to mention the competitive cost of labor.

What are the goals and vision for Bancomext with regards to the aerospace industry in Mexico?

EM: Bancomext has very competitive financing and one of our advantages is that we can provide very long tenors, such as 25+ years, that are not usually found in the market. Bancomext wants to be an alternative for the sector’s financing and go hand-in-hand with the principal players in aerospace as well as with the clusters with the hope of integrating the value chain in Mexico. The industry needs to keep developing in order for employment to keep increasing, and for Mexican players to rise in the sector of the aerospace industry.

Most of the companies that come here are huge multinationals that are not only involved in aerospace, so we want to keep attracting these companies, but also give them the right framework to spread their wings and delve into the other sectors that can create employment and revenue for Mexico. Other players will be needed as suppliers, which will eventually bring in technology and advance the Mexican workforce and productivity.

Can you provide us with a brief introduction into Bancomext?

FHU: Bancomext is a development bank in charge of fostering and financing companies in Mexico, which can international trade, and is geared towards serving the sectors that have significant roles in the Mexican export market, including automotive, tourism, and industrial real estate for the establishment of productive plants in Mexico. In addition, Bancomext focuses on clean-energy initiatives, the mining sector as well as logistics, transportation and aerospace. Our main goal is to ensure that there is a competitive and efficient logistics infrastructure for commerce in and out of Mexico.

To what extent is Bancomext interested and involved in aerospace?

FHU: Bancomext’s involvement in aerospace has been indirect, specifically by helping finance these sheltering companies. Shelter schemes can offer certain benefits for companies looking to invest into Mexico, like not needing to make capital investments, nor hiring personnel, nor creating a legal company structure. On the contrary, these companies connect with various commercial real estate developers who take care of topics like finding the specialized technical personnel, importing the raw materials, and all these types of processes, allowing the OEMs to focus on their operations while these sheltering companies take care of administrative and legal aspects. Bancomext helps finance these sheltering companies.

What opportunities does the aviation industry represent for Mexico?

FHU: In Mexico, the aviation story is now a modern and young one, whereas in Latin America only four airlines control around 60% of the market, in Mexico the market has a large component of fairly new airlines that started off as small niche players, but have grown significantly and increased competition in the market. When comparing Mexico with Latin America, Mexico has grown in the last three years in terms of passenger numbers by over 10% to 13% per annum, translating into investments in fleet growth and modernization of all Mexican airlines. The consumers have benefited incrementally as the prices keep dropping as a result of increased competition.

All these factors are driving growth, which translates to airlines renovating or changing their fleet, which is a major trend seen mainly in Asia Pacific, China, and the Middle East, like Kuwait and Saudi Arabia. OEMs currently have orders that are up to their capacity for the next eight years, meaning that if a Mexican company wants to buy a airplane, it must buy them years in advance, and must solicit financing from institutions like Bancomext in order to secure it.

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“Biculturalism stemming from the United States and technical support from such proximate relations has proven especially conducive to continued investment and business in our state.”

- Tomas Sibaja,
Executive President,
The Aerospace Cluster of Baja California
AN INTRODUCTION TO BAJA CALIFORNIA

Baja California, the oldest and largest of Mexico’s aerospace hubs, is home to almost a third of the total number of aerospace companies in Mexico. Located in the northeastern corner of the country, the state’s major advantage is that it shares a border with the United States, thus giving companies easier access to North American suppliers. Quick access to major ports and border crossings are additional strengths.

Baja California’s 80-plus aerospace companies are located around Tijuana and Mexicali, with smaller concentrations around the cities of Ensenada and Tecate. With 50 years of experience in the industry, Baja California’s maquiladora program allows companies, usually from the United States, to open manufacturing operations in Mexico for significant tax reductions. 70% of the aerospace companies established in the state have a direct relation with California, and are expecting to increase that figure next year,” said Carlo Bonfante, the secretary of Economic Development into the state, and are expecting to increase that figure next year,” said Carlo Bonfante, the secretary of Economic Development for Baja California (EDC).

The prevailing focus of the government is to develop a greater presence of small and medium-sized companies engaged in the aerospace industry. It is this Cali-Baja term that is one of the most commonly cited advantages of aerospace operations in the region. The so-called mega-region, comprising of Southern California, Baja California and to a certain extent Arizona, allows companies operating south of the border to source supplies from the much more developed and established U.S. aerospace sector while benefitting from the low-labor cost and tax incentives available in Mexico. With a good logistics framework giving access to all parts of this region, collaboration between the two countries and businesses operating in both has flourished. "Cali-Baja Mega-Region initiative is something that has been in the works for about six years. The EDC is not competing with our counterparts, but rather we are complementing each other,” said Rigel Navarro, executive director of the Tijuana Economic Development Corporation, a non-profit trade organization. "There is a very interesting flow of trade, human re-

sources and communication. The only limitation is to cross the physical border.”

Being able to offer more than just competitive labor rates is an important factor in attracting large players to the State of Baja California, a private jet OEM that is wholly owned by General Dynamics, began its manufacturing operation in Mexicali in 1983. Today, Gulfstream Mexicali employs over 1,600 people, a workforce double what it was ten years ago. "Gulfstream Mexi-
cali plays a significant role in the manufacturing process for Gulfstream aircraft,” said John Ortega, vice president and general manager of Gulfstream Mexicali. “The site’s employees make wiring harnesses, sheet metal components, subassemblies and machined parts that are used in the manufacturing process of Gulfstream’s full fleet of in-production aircraft.”

Ortega also notes that the ease of access to the U.S. is one of Baja California’s major competitive advantages over Mexico’s other clusters. In Tijuana, Baja California has developed a specialization in electronics. Benchmark Electronics Tijuana was formed in 1985 and today manufactures circuit card assemblies, subassemblies, box build, and very large scale integration. General manager Rod Gunther said: “Benchmark Electronics has designated its Tijuana facility to be its avionics center of excellence.”

The biculturalism present in Baja California persuades sister companies in the United States to export more complex processes to the region. For instance, Switch L & J is the Mexican counterpart of Electro-Mech, which manufactures joystick and autopilot switches and has been present in Baja California since 1966. Esterline’s presence in Tijuana further strengthens Baja California’s reputation in the field of electronics

Zodiac Aerospace, a globally recognized aircraft interiors company, has a facility in Baja California in addition to its operations in Chihuahua. The presence of international giants, however, does not mean there is a shortage of opportunity for smaller Mexican companies. Innocentro is a recently established interior company in Mexicali. Roberto Corral, the company’s General Manager, said: “The aerospace industry is moving towards lighter and more convenient equipment.”

Baja California is mature enough that it can be more progressive in global trends. UTC Aerospace broke ground last year on a new facility in Mexicali that is focused on composite bonding. Also in Mexicali is GKN Aerospace Composite Structures, but general manager Loren Engel, expressed more tempered hopes for prog-

ress: “In terms of the engineers, the technical transfer is still chal-
lenging and we are still moving towards getting the right systems accessed.”

To summarize Baja California certainly owed its initial growth to the ‘Cali-Baja’ mega-region. However, through the strengthen-
ing of links between industry, government and academia Tijuana and Mexicali have become competitive destinations not just for manufacturing, but also more value added and complex processes. 

Design and Engineering in Baja California.

Despite the efforts of these international companies to undertake more technology transfers from their headquarters, there is a gen-
eral reluctance from the global aerospace community to view Baja California and Mexico in general as capable of providing reliable design and engineering solutions. This reluctance means that it is up to the international prime contractors that are already operat-
ing in Mexico to promote Mexican capabilities to the world, as they are the most aware of their capabilities. International players Honeywell, Eaton, and Hutchinson are all carrying out design and engineering work in the region. "OEMs are relocating to Mexicali and Tijuana to carry out design work, e.g. Honeywell and Eaton Aerospace respectively. The design work in Mexico is being driv-

en by OEMs and not the contract manufacturer,” said Rod Gun-
ther, general manager of Benchmark Electronics. Honeywell, the 11th largest aerospace company in the world in 2014 in terms of revenues, has its largest concentration of global employees in Mexico and opened its first manufacturing facility in Mexicali in 1980. The company came to appreciate the innovation and intellectual capabilities available in Mexico and opened the Mexicali Research and Technology Center (MRTC) to support Honeywell’s global operations. In 2007, it started supporting the engineering and design efforts of several component systems that go into Airbus’ A350. Honeywell’s Mexicali research facility is on par with design centers around the world and is fast becoming recognized as an important player in global aerospace innovation. The success of this center is due in no small part to the efforts of its engineers. Honeywell MRTC worked with local university CE-

TYS to build a curriculum that was aligned with the center’s needs and today many of their engineers are sourced locally. Hutchinson is another international company that has capitalized on Mexico’s available talent and has developed a strong engineer-
ing team in Mexico over the past 10 years. The facility in Ensenada is currently working on a product for the Boeing 737 MAX that was developed with the help of its Mexican design team. President and CEO of Hutchinson Aerospace and Industry in Mexico, Tad Shiner, said: “We have tapped into the hugely talented human re-
sources pool and as a company with a strong Mexican staff, we want to promote to the world that our organization and engineers from this country are as capable as those from the U.S. or Europe.”

Gulfstream also has a group of 30 employees who support engi-

...
neering needs for production and completion, while GKN Aerospace Engine Systems in Mexicali has a small, dedicated engineering team but which does not currently design any aircraft products that GKN manufactures. However, general manager Andy Najafian said: “We cannot rule out the possibilities of future strategic investments that may include taking advantage of opportunities available in Mexico for design, development and engineering at a larger scale.” Smaller companies are also appearing in the Baja California region and offering engineering services. Leyman Engineering offers custom-made services in design engineering, while Spectrum Integrity collaborates with academia to encourage the younger generation to participate in complex defense projects.

The state’s major private university, CETYS, is in the process of completing its Center for Innovation and Design (CIED), which is based on the Warwick Manufacturing Institute in the UK and the Arizona State University Polytechnic Campus in Chandler. The university, which offers a variety of engineering and technology programs in Mexicali, Tijuana and Ensenada, wants to develop a talent pool that is more oriented to research and innovation rather than one that is focused on manufacturing engineering. The president of the university, Dr. Fernando León García, said: “We hope to achieve national and international recognition in applied research and technological development supported by high level researchers and based on an agile and sustainable linkage model with industry.”

The Autonomous University of Baja California (UABC) has worked with Honeywell to develop an aerospace bachelor’s degree. FLOR.

There is also currently a shortage of engineers in the United States and companies north of the border should look to Mexico to fulfill their personnel deficits. Mexico produces more engineers per capita than the United States and Canada. This available talent is a major reason why companies should be confident in migrating processes that involve design and engineering to Mexico. Bazz Houston, a California headquartered company that manufactures components for the aerospace industry, has developed its engineering team in Mexico through cross-training its personnel with its facility in Garden Grove, which is driven from Tijuana. The company now wants to leverage its engineering capabilities in Mexico to find new customers.

“We want to work with custom who value our engineer- ing time,” said President and CEO Jaster Jacobs. Baja California possesses important strengths in its human capital and infrastructure. Above all there is a staunch will- ingness in the state to develop its design and manufacturing capabilities in aerospace. The challenge now is to discard the stigma of being simply a manufacturing destination by promoting the state’s success stories internationally. Honeywell seeks to do just that and works with ProMexico to showcase the company’s success in design and engineering in Baja California. Baja California’s, and Mexico’s in general, advantages in design and engineering bring to its industry a step closer to being a destination that may one day address the full life cycle of an aircraft.

As the oldest aerospace cluster in the country, can you talk about its development over the past fifty years?

Baja California has a 50-year-old aerospace cluster, leading Mexico in the number of aerospace companies established in the state, which represents 25% nationwide. Our aerocluster is a diverse set of aerospace companies, from single assembly to those with more complex processes. Companies like Rockwell Collins, Chromalloy, Gulsream, Honeywell or UTC are the ones that have been here the longest and represent important pillars to our industry.

Geographically, we are close to the United States, and importantly next to California, which is one of the seven biggest economies in the world. This has allowed us to increase employment in the area, and to develop a local supply chain. We have to grow and develop a clear and support-
How has the aerospace cluster in Baja California evolved to become the most important region for aerospace production in the country?

Michael Porter coined the “clustering” theory in the early 1990s in his book The Competi- tive Advantage of Nations which introduced this notion in an article published in the Harvard Business Review in 1998, ‘Clusters and the New Economics of Competition’. Mr. Porter encouraged companies from a given industry to cluster in close proximity to benefit with suppliers of specialized inputs such as components, machinery, services, and providers of infrastruc- ture - including academia and stakehold- ers. This way, larger and smaller firms could experience collective benefits. This idea was not specific to the aerospace industry, and has been adopted in many countries across vari- ous sectors.

The development of this type of cluster, along with an accompanying mindset of competitive collaboration, has been an effective means of growing our aerospace cluster in Baja Califor- nia. In the 1960s, Mexico partnered with its northern neighbor, the United States, in its new capacity as the country’s supply manufac- turing base, mostly in the northern Mexican states at the border. California with the 7th largest defense and aerospace fleet in the world located minutes away from our border here in San Diego did its part stimulating Baja’s aerospace production, and eventually led to an ecosystem of five major aerospace firms currently active: commercial aviation, defense, space, unmanned aerial vehicles and maintenance, repair and operation services. In fact, the first aerospace company establishing a presence in Mexico did so in Baja Califor- nia in 1966. The Aerospace Cluster of Baja California started officially in 2006 with the idea to improve inner relations amongst companies located here.

The task was at times discouraging. The aero- space industry moved into the region solely market-driven by convenience of location. There was no coherent industrial policy spe- cialized per sector showcasing the advan- tages of being under a cluster initiative. The cluster term was more commonly known as a concept in research education than as an active organization in the field. The industry knew better flying solo following the trails of competitors or clients to their business, why bother with an extra layer of data provision? Nonetheless, we succeeded.

What strategic advantages does Baja California offer?

As the northernmost state in Mexico, Baja California shares its border with a strategic ally, California. More than 70% of the aero- space companies established in our state have a direct relation with California. Additionally, the biculturalism stemming and technical support from such proximate relations has proven es- pecially conducive to continual investment and business. In an increasingly globalized economy, we are experiencing more visiting companies from all over the world, but we have to offer more than proximity to welcome complex projects. Location is a great value, if off ered with a value proposition well struc- tured and salable. For example, while other clusters offer labor, land, and logistics, mem- bers of our cluster are actively engaged in collaborative efforts at different levels of produc- tion or specific market requirements. We have various cluster-wide initiatives and projects should and operate truly as a cluster value shared offering, rather than a generic promotional tool

What challenges do companies in Baja California face?

Today, the aerospace supply chain requires more small and medium-sized companies in the market, and the school should provide more involvement from the industry in their educational programs. It is not easy to substi- tute or change global suppliers for our ti- ter-one and tier-two companies. New entrants should be supported during the entire process. Schools also require more involvement from our industry in their educational programs.

We need to start providing content aimed at technical training institutes and engineering areas that demand particular base knowledge in the field, for example.

As Baja California’s aerospace industry matures beyond the traditional maqui- ladora program, what will be the role of design?

Honeywell MRT Center is a great example of how Baja California’s young talent is be- ing leveraged to incorporate design into the aerospace field. Leyman Engineering is a pri- vate firm offering custom-made services in design engineering. Catia and Solid-Works also offer training courses to a young cadre of college students. Companies and serv- ices with an entrepreneurial base. Spectrum Integrity also collaborates with academia to groom young kids to participate in complex defense projects. Our mission now is to show that Baja California and Mexico can operate in the field of design.

What goals do you have for the growth of Baja California’s aerospace industry?

Firstly, the active collaboration, exchange of information, and sharing of best-business practices is the way forward. As one of the leading clusters in Mexico in the aerospace sector with strong ties to clusters abroad, we want to showcase our Mexican strengths and business opportunities that benefit the global industry. Rather than competing with other clusters abroad, we want to clearly ar- ticate our capabilities and strengths to the international market. In this way, we will be better equipped to strategically serve origi- nal equipment manufacturers, based on their specific competences and requirements. The Aerospace Cluster of Baja California should be identified as a tool of global efficiency and expertise in the aerospace sector.

Can you provide details about the facili- ties, equipment and certifications that are supporting your Mexican operations?

As mentioned earlier, Gulfstream Mexicali is a state-of-the-art engineering facility. We do not provide details on the specific equipment used there. However, we would like to note the continu- ing improvement culture found through- out Gulfstream, perhaps no more so than in Mexicali.

Employee involvement is encouraged along with the incorporation of lean tools and phi- losophies into ongoing processes at the site: manufacturing, engineering, business-sup- port activities and management. A culture of continuous improvement emp-owers all employees to submit ideas that make their job easier, foster a more innova- tive work environment and transform their abilities, capabilities and knowledge. In 2004, Mexicali employees submitted more than 500 ideas to improve the site’s processes. In 2008, the submissions grew to nearly 34,000. In 2009, Gulfstream Mexicali was awarded the Shingo Prize for Operational Excellence for its focus on lean manufac- turing and elimination of waste. It has been named among the 100 Great Places to Work in Mexico for the past four years. Gulfstream Mexicali was named the 12th Best Place to Work in Mexico for 2015.

What are the key advantages that Baja California offers to Gulfstream and the global aerospace community?

According to a 2012 George Washington University study, Baja California has more than 40 years of experience in the aerospace industry. The study indicates that the state’s large concentration of aerospace companies is due mainly to the supply chain proximity to California and Arizona and the availability of a strong labor force. The study adds that Baja California has a big competitive advan- tage over other Mexican states in terms of infrastructure (highways connecting Mexico to the United States, major cargo seaports, in- ternational airports, railways services and di- rect border crossing sites, with several ports of entry to the United States).

Can you discuss how Gulfstream collabora- tions with local academic institutions to support its human resources needs?

Gulfstream Mexicali pays for employees to pursue training and academic degrees at a lo- cal university and funding the children of employees family members are eligible for CETYS Uni- versidad scholarships sponsored by Gulfstream Mexicali.

How is Gulfstream Mexicali growing its capacities in design?

Gulfstream Mexicali has a design group of 30 employees who support engineering needs for production and completions.

What are Gulfstream’s major goals for the coming five years?

Gulfstream Mexicali will be instrumental in the manufacturing of our newest aircraft, the wide-cabin and long-range G500 and G600, producing wiring harnesses, sheet metal components, sub-assemblies, and machined parts. The G500 is scheduled to enter ser- vice in 2018, while the G600 will follow in 2019.
Can you provide an overview of Honeywell’s history in Mexico’s aerospace industry?

Honeywell as a corporation has been in Mexico since 1947 and has more than 17,000 employees spread over three business units: automotive and control solutions, and environmental and control systems. Today Mexico represents the second largest concentration of Honeywell employees globally. Our involvement in aerospace began in 1980 with the manufacturing facility established in Mexicali. It is of center of excellence (COE) for environmental control systems and components; it also has a strong footprint in the production of power-generation components for aircraft.

Can you introduce the Mexicali Research and Technology Center (MRTC) and highlight its main areas of focus?

Honeywell’s Mexicali Research and Technology Center is focused in four main COEs. The first is design and development of products. The second is the design and development of testing solutions. The third is a systems-integration laboratory (SIL), and the fourth is a global business center. Over 70% of the more than 500 employees at MRTC come under the umbrella of the engineering and technology business unit.

Can you provide the key reasons why Mexicali was chosen as the location of this COE and the role that it is playing in global aerospace operations?

Mexicali was chosen for several reasons. The key one being the availability of a talented workforce in the region. There is currently a shortage of engineers in the United States, so the MRTC was part of Honeywell’s strategy to tap into those regions offering young talent that can support the aerospace industry. A second reason is the proximity of Mexicali to Phoenix, Arizona, and Torrance, California. In doing this, we were able to proactively identify the required synergies and collaboration that we could subsequently achieve by being next door to our manufacturing operations.

Are you able to provide a case study of a recent defining project?

The Airbus A350 is a good example. Mexicali, and Mexicali in general, is playing a key role originally on the development and now in supporting the aircraft in the market by making sure it meets the demands of Airline Operators. In 2007, the MRTC started supporting the engineering and design efforts of several component systems that go into the A350. We had a lot of influence on the design of several component systems for this platform. Once we started moving into the development stage, our systems design laboratory (SIL) was a key enabler to support the aircraft. Mexican engineers have a very large and extremely expensive so this facility to 45,000 square feet. At this point we ramped up business by adding more machines, products, and machining engineers. We then continued to leverage opportunities and invested in all the right programs with future growth in mind.

Can you introduce GKN by providing a brief overview of the company’s history in Mexico?

GKN (Guest, Keen, Nettlefolds) was founded in England in 1759. It has been around for more than 250 years and has reinvented itself as a global leader in the engineering and manufacturing of high technology and complex products. GKN’s aerospace division is split between Engines and Aerostructures products. Its operations span over 100 sites in 30 countries on three continents. GKN has over 40 years of experience operating in Mexico through automotive facilities in Celaya. Our aerospace footprint in Mexico includes four sites across three states. Two sites are in Mexicali, one in San Luis Potosí, and one in Chihuahua. Our Mexicali metalcast facility falls into the engine systems business segment of GKN Aerospace, and we are part of GKN Aerospace – Engine Products West, headquartered in El Cajon, California. Our products reach the prime engine original equipment manufacturers such as GE, Pratt & Whitney, and Rolls-Royce through our facilities across the world.

What was behind the decision to expand to Mexico?

The decision to expand our aerospace operations to Mexico was twofold. We were encouraged by our customers to have access to emerging markets and cost-competitive regions to ensure that we, as a tier-one supplier, would be able to continue offering services at required aggressive cost-competitive rates. Then it was GKN Aerospace Engine Products West’s initiative to explore opportunities for improved cost and gross margins contributing to the future success and competitive advantage of the company.

Can you provide details of the process that GKN underwent to ramp up business in its Mexicali facility?

Unlike many of the large players here in Baja California who come in with a large upfront investment, GKN Aerospace decided to start with a small operation. It was important for us to first be able to offer the complete portfolio of components and systems to a local company to be considered a viable source of supply. We were producing enough parts at the right quality and competitive price that we became successful in our Mexicali facility?

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Honeywell’s Mexicali Research and Technology Center (MRTC) and highlight its main areas of focus?
Can you give a brief introduction to Innocentro and the company’s involvement in aerospace?

RC: The original company was established 13 years ago and in 2014 the company became Innocentro LLC. Innocentro is a Mexican company that can offer various services and skills to the aerospace industry. It is making progress in relation to cabin interiors, offering solutions for the equipment mounted on the galleys and galley themselves. The aerospace industry is moving towards lighter and more convergent equipment. All the materials used in this industry need to be certified and thus all the designs have to make sense. Aerospace offers significant opportunities, as there is equipment that can be reused, refurbished and retrofitted. Retrofits are becoming the focus, as one does not need a huge factory with thousands of people. They are the core of the MRO industry. In Mexico, this industry has been growing substantially, as there are not too many companies that do speciality work on specific parts of aircrafts. Innocentro’s core competency does not only come from the engineering side, but has transferred to the manufacturing side. The company is starting to build its own brand in terms of manufacturing, and the brand is called Ingeniero.

BJ: Innocentro has full metal shop capabilities. The company has CNC machining of all metals, lasers and sheet metal punch and bending equipment. Innocentro has a significant amount of experience in making parts in different materials for airplanes as the company has been in the aerospace industry since day one. Innocentro is very aware of all the requirements for AS 9100 and certification. The company mostly does contract manufacturing and most of the manufacturing is done in Mexico. As Innocentro complies with U.S. standards, it can subcontract manufacturing jobs to North American companies.

What is Innocentro’s strategy for defining the product portfolio and what is the company’s added value with this range of products?

RC: Innocentro LLC just created the Ingeniero brand. The company intends to target the customers that we already have a good relationship with. Innocentro is no longer going to subcontract manufacturing, but rather is very aware of all of the requirements for AS 9100 and certification. The company mostly does contract manufacturing and most of the manufacturing is done in Mexico. As Innocentro complies with U.S. standards, it can subcontract manufacturing jobs to North American companies.

What are some of the key strengths that Mexicali offers as a destination for the aerospace sector?

BJ: Mexicali is a city that people like to work and want to work as to improve their lives. Due to this city has major opportunities. In Mexicali, there is a very stable and skilled population. There are also numerous engineering training institutes and the government is putting in a significant amount of money towards investing in its own people.

Mexico and Tijuana both have specialized companies that have paved the way for the aerospace industry for over 10 years. Between the two clusters, there is a significant amount of advantage for the state as a whole. Tijuana has more companies employing fewer people with niche capabilities, while in Mexicali you will see larger companies with a more in-depth knowledge base.

As these two clusters have evolved, what are you seeing develop on the local growth of the supply chain?

BJ: The local suppliers are growing but, in order to sustain a very large manufacturing push in development, more still needs to be done. Over 95% of supplies are still imported. If we want Mexico to grow a local supply base, it has to be driven by the large OEMs and tier-one companies.
Can you introduce CETYS by providing a brief overview of the university?

CETYS is a private university that was founded in 1961 by business and industry leaders who envisioned a high-quality institution for talented youngsters from Baja California who would otherwise migrate to other regions in Mexico. Today the university is governed by more than 100 of Baja California’s business and industry leaders, is ranked among the top ten private universities in Mexico, and is one of eight universities in Latin America with U.S. accreditation. The aspiration for CETYS has always been to contribute to the economic, cultural and social growth of the region. In addition to instilling humanism and values across the curriculum, we emphasize six key, distinctive, CETYS learning outcomes into our programs: entrepreneurship, linkages with industry and business, internationalization, information literacy, social responsibility and sustainability. CETYS currently serves a total of 7,200 students across the state and hopes to grow to 8,000 by 2020. We are intensifying and reorganizing our interaction with business and industry by focusing on three themes through each of our colleges: competitiveness and entrepreneurship (business), innovation and design (engineering), and human and social development (social science and humanities). This will help us be more active and in tune to what is happening in business, industry and society.

Can you provide more details as to the type of engineering formation that you offer and how the curriculum is designed?

Through our college of engineering we offer a variety of engineering and technology programs in Mexicali, Tijuana, and Ensenada that are closely linked to regional industry including the extensive presence of multinationals. Through our Center of Excellence in Innovation and Design (CEID), based on the Warwick Manufacturing Institute in the UK and the Arizona State University Polytechnic Campus in Chandler in the United States, we aim to generate knowledge and human capital in innovation and design fields of engineering with the purpose of increasing the competitiveness and economic development of the Baja California region. Furthermore, we hope to achieve national and international recognition in applied research and technological development supported by high-level researchers and based on an agile and sustainable linkage model with industry.

Do you have a final message for our readers?

One of the top private universities in Mexico
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What are the strategies and processes by which CETYS is establishing linkage with industry?

While we continue to work with key individual industries, we are increasingly focusing our work on the main clusters in the region. An organized cluster makes the linkage process with industry more strategic in reach and impact. With regards to the aerospace industry in Baja California, we are working with the leading companies in Mexicali and Tijuana, trying to take this collaboration to a new level, and ensuring that the needs of the cluster are better addressed and more seamlessly integrated. In the area of engineering, we are focused on six industry clusters and working with each to identify their needs. For example, with the aerospace industry we are seeing a current need for design and engineering. From here we can take these elements and incorporate them across our academic programs and find commonalities. CETYS is constantly making efforts to reorganize and look at how we can better collaborate. We recently met with Honeywell who shared with us the long-term vision for its facility in Mexicali and, accordingly, we can incorporate into program enhancement and training of current and future engineers, as well as applied research and problem solving projects. We also work closely with SEDECO so we can learn first hand what changes may need to be made.

To what extent does this dialogue go both ways and what influence will academia have on the direction of industry?

Through our dialogue with industry we always offer an initial diagnosis as to where we believe they are headed, establish a process by which we can guide them, and identify priority areas to work on. What we have seen is that companies such as Honeywell, Gulfstream, and UTC are looking at either larger more sophisticated operations or enhancing and expanding current operations based on what they see the region can deliver particularly with regards to human capital. The soon-to-be-constructed CEID is based on a very intense and close-knit interaction between industry and the university. CEID will have an area to accommodate eight to 12 projects that will be based on and dedicated to solving actual industry problems.

Do you have a final message for our readers?

Based on the recent accreditation in the United States of our first engineering program by the Accreditation Board on Engineering and Technology (ABET), CETYS aims to be by 2021 the best institution in Latin America, offering engineering programs with focus on innovation and design, with the same aspiration for our MBA, with a focus on entrepreneurship. We intend to raise our collaboration with industry in the region to new levels that will support the continued and strategic development of key clusters, in particular the aerospace industry.
Baja California’s aerospace ecosystem still resembles an inverted pyramid, with gaps being identified in special processes and non-destructive testing. More support for suppliers will be required, including government funding and learning from the experience of other companies in the cluster. “It is not easy to substitute or change global suppliers for our tier-one or tier-two companies,” said Tomas Sibaja, president of the Aerospace Cluster for Baja California. “Therefore, if we want to submit more [local] candidates, these new companies should be supported during the entire process.”

Developing a local supply chain has been impeded somewhat by the easy access to suppliers in the U.S. Many processes, including heat-treatment and non-destructive testing, are still mostly outsourced to the United States, but Eduardo Solis, sourcing and global offset manager for Eaton Aerospace in Tijuana, believes the environment is right to start localizing the supply chain. So- lis has been tasked with having 50% of expenditure on materials for the Tijuana facility sourced in Mexico by 2020. “Eaton are very active in encouraging the growth of SMEs operating in the aerospace industry in Mexico not only for its own needs, but also to ensure the country’s industry as a whole increases its competitiveness.”

One strategy being taken is to entice suppliers that are located not far north of the border to take advantage of the growing business and competitive labor costs of Mexico. BAP Aerospace, a Los Angeles based company, expanded to Baja California to meet the plating needs in the aerospace industry. Their president, Cruz Maldonado, said that companies were more willing to seek plating services locally from BAP because the company is “a widely known name and has a reputation of delivering high quality services.”

For the local companies once again certification a major challenge. However, to be competitive against suppliers in the U.S. this is essential. But for companies to achieve this they need financial support. Andy Najafian, president of the Aerospace Alliance of Baja California, a non-profit civil association that represents Mexican based aerospace companies, said, “[The Aerospace Alliance] wants to create an ecosystem by which the common processes required by the aerospace industry will be available to all. To achieve this it will again be a case of greater leverage of government funding.”

Government funding is available through a number of schemes but it seems that access is not that easy or companies are simply unaware of the availability of such funds. One local company that has been successful in achieving certification is Anodimex. Anodimex, a Tijuana-based company that offers anodizing services, recently attained NADCAP certification. The company was lucky enough to have strong support from Zodiac and so was able to achieve this. Similar to the thinking in Querétaro, Anodimex believes that there should be more support from prime contractors to help develop local SMEs. “In order for there to be a sustainable aerospace industry in this region, OEMs, tier ones and twos must do more in the way of aiding SMEs to integrate themselves as suppliers,” said Anodimex’s president, Roberto Limon. “If this does not happen Baja California will not be able to remain competitive on a global scale. There must be more in the way of communication throughout the whole supply chain.”

One aspect of the aerospace supply chain that has been highlighted by companies as needing addressing is raw materials. In Baja there is not as much of an imperative to achieve this as Baja’s closer proximity to the United States lends easier access to raw materials. Companies further benefit from swifter border processes and a more robust logistics framework. However, a number of distributors from north of the border see moving to Baja California as a stepping stone to serving Querétaro and the south of the country where access to raw materials is more challenging. Three distributors that are now serving the aerospace needs in Baja California are Ryerson, Castle Metals and Coast Aluminum. “To develop a local Mexican supplier to be at the level able to serve the aerospace sector is a process that can take years...” said Angel Torres, general manager of Ryerson Tijuana. “The industry in Mexico is behind in this sense either in being able to develop local sources or to have U.S. vendors open facilities here. I think though that the cluster is working hard on resolving this and I believe it will change.”
one dedicated to the aerospace business. The operation was started in 2006, in a 282,000-square-foot facility, and has a workforce of 600+ people. The three main product lines manufactured here are ducting for high and low pressure applications, assembly of solenoid valves, and assembly of fluid distribution components (hoses, fittings). The majority of the components manufactured at this site are shipped to other Eaton Aerospace facilities to integrate for shipsets for customers. The Eaton Aerospace Tijuana facility is positioned as a center of excellence for ducting solutions, and today is one of the best facilities worldwide for Eaton Aerospace.

Where have you identified gaps in the human resources chain in Mexico?

Over the last ten years Mexico has received more aerospace FDI than any other country in the world. Last year, we exported $4.6 billion in aerospace business. However, around 60% of this was material and less than 10% of that was purchased in Mexico, which illustrates the significant gap in our local supply chain. In a sustainable aerospace industry, a pyramid is formed from a wide base of small- to medium-sized suppliers above which you have a smaller number of tier-one and tier-two companies and then at the top the original equipment manufacturer (OEMs). In Mexico, this is inverted; we need more in the way of small and medium-sized enterprises (SMEs) to satisfy the base of the pyramid, but what those companies need in order to do so is technical talent, of which there is a distinct shortage in Mexico. There are a great many universities that are graduating aeronautical engineers, but having enough technical talent in fields like CNC programming, welding, composite assembly, complex assemblies, quality inspectors, chemical processing, thermal processing, etc., required to support the development of a supply chain in Mexico.

How has Eaton sourced its local suppliers?

Mexico is a strategic area of sourcing for Eaton. When I joined Eaton about six years ago there existed very few companies that we able to comply with the quality measures imposed by the aerospace industry (AS9100 and NADCAP), outside of the major OEMs and tier-one and-tier-two companies. The last decade has seen Baja California go through an intense learning curve and process of establishing its reputation as a destination for aerospace, during which the region was not in a position to be supporting local suppliers. However, now the environment is right, and Eaton’s Tijuana facility is in a position to start significant localization of its supply chain into Mexico. Our task for 2020 is to have 50% of our spending on direct materials for this facility sourced into Mexico.

What are the major challenges in achieving this?

One is the aerospace business model. The industry is high-mix and low-volume; companies need to be able to absorb business in this scenario, which include not only the machines and technology, but also the technical talent to be able to develop and maintain them. Second, is the implementation of a AS9100 certified quality system or in the case of special processes (chemical processing, thermal processes, welding, non-destructive testing, etc.) a NADCAP accreditation, and this is only the entry, since in cases several customer approvals are required in top of oas of and NADCAP. Of course this has meant that the process of bringing on a new supplier in Mexico is extremely slow, in part also, due to all the validations required to put our parts in the air. Another major challenge is that unlike the automotive industry, where a supplier can dedicate an entire facility as the source of all its business with one customer, an aerospace supplier must have a number of customers to be sustainably viable.

Eaton is active in encouraging the growth of SMEs in Mexico not only for its own purposes, but also to ensure that the technical talent that increases its competitiveness. We have a good success story with Barry Avenue Plat- chin from Los Angeles and BAP Aerospace, which is Mexico in Tijuana, which has an excellent reputation in the global aerospace industry with more than 60 years in business of aerospace plating/chemical processing. As aerospace companies in Mexico are embracin this NADCAP accredited compa- ny, BAP Aerospace de Mexico is today the most recognized aerospace plater in Latin America, which is based on the number of approvals from OEMs and tier-one and-tier-two companies that they hold. We are proud to be the first and anchor partner to BAP Aerospace de Mexico.

Can you provide an overview of Eaton’s operations in the aerospace industry?

Eaton is a diversified corporation with headquarters in the United States and annual sales of around $23 billion. About 60 percent of Eaton’s business is in electrical equipment/solutions and the rest in the information and control, and engines.

What is the importance of the Tijuana facility to your global aerospace operations?

With 20 facilities in the country, Eaton Corp. has a strong presence in Mexico, though this facility in Tijuana is the only facility dedicated to the aerospace business. The operation was started in 2006, in a 282,000-square-foot facility, and has a workforce of 600+ people. The three main product lines manufactured here are ducting for high and low pressure applications, assembly of solenoid valves, and assembly of fluid distribution components (hoses, fittings). The majority of the components manufactured at this site are shipped to other Eaton Aerospace facilities to integrate for shipsets for customers. The Eaton Aerospace Tijuana facility is positioned as a center of excellence for ducting solutions, and today is one of the best facilities worldwide for Eaton Aerospace.

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Benchmark desired to have a northern Mexico facility to complement its central Mexico facility in Guadalajara. Since Benchmark focuses on high reliability markets, its Tijuana facility focuses on avionics, medical and high-end industrial was a natural fit.

Can you give details of your facility, key equipment and certifications; and do you offer post-sale and service support from your Mexico facility?

The company’s facility in Tijuana is 107,000 square feet, with 252 employees. Equipment includes seven SMT lines; Surface Mount Technology; six wave soldering machines; two selective soldering machines; six Selective Conformal Coating machines (85% of CCAs will be conformal coated); Benchmark’s certifications include: AS 9100, ISO 9001, ANSI S20.20; and in early 2016 will have NADCAP certification.

Can you give details about your facility and its key equipment and certifications?

The company’s facility in Tijuana is 107,000 square feet, with 252 employees. Equipment includes seven surface-mount technology lines; five wave-soldering machines; two selective soldering machines; six selective conformal-coating machines (85% of CCAs will be conformal-coated). Benchmark’s certifications include: AS 9100, ISO 9001, ANSI S20.20; and, in early 2016, will have NADCAP certification.

Can you give a case study of an aircraft you have recently worked on?

Benchmark is currently building actuators that are used to control smell, elevator, rudder and spoiler for the Airbus A350 and Boeing 787. They entail building circuit cards, putting the end item together, and recording the automatic torque for traceability including the running and final torque. When built, functional test and highly accelerated stress screening are required, as well as random vibration to simulate stresses during flight. What were the biggest challenges for the company in its tech-transfer to Tijuana? What are the major challenges that Baja California offers as a hub for aerospace? The biggest challenge is the thought pattern shift of aerospace companies in the United States that the low-cost region of Tijuana is a good destination to source products for the original equipment manufacturers (OEMs). They will have their own personnel to stay on in the region. However, geographically, Tijuana is ideally situated, being close to San Diego, having bilingual personnel, and sharing a time zone; Benchmark’s Tijuana facility is only 45 minutes’ drive from San Diego’s airport. Benchmark has been established in Tijuana for over 25 years; its avionics business surged 12 to 15 years ago upon the introduction in 1997 of the North American Free Trade Agreement (NAFTA). Our staff of 3,500 employees works four shifts. We are fully integrated vertically and have around 1,800 automated machines that run 24/7. We are constantly exploring new ways in which we can reduce cost and increase productivity. From fiscal year 2011 to fiscal year 2014, we increased our capacity by 147% and saved $20 million through cost-saving initiatives.

Why is important is aerospace to Skyworks Solutions?

Skyworks sells a majority of its aerospace and defense solutions through distributors, who in turn sell directly to larger industry customers. Mexico has experienced an aerospace boom over the past ten years and certainly there has been an increased need for our commercial, off the shelf sector devices that are then incorporated into larger platforms. How does Skyworks help develop talent in Baja California to support its human resources needs?

One major advantage the Baja California area offers the industry, and in particular Mexico, is access to a wealth of talented individuals. Skyworks Solutions is very involved in developing this. The linkage committee in Mexicali is an effective communications platform for companies to come together with representatives of academic institutions and discuss the current needs and requirements of the various industries operating in the area and ultimately develop the talent that we need. It is very important that we be heavily involved in linkage activities, as ultimately they will define the future of industry, and we have been doing so for over 20 years. In Baja California, we have 12 universities and over 48 technical schools, which together produce up to 15,000 engineers on a yearly basis. Skyworks Solutions also has a program in place whereby we scout universities for some of the best students to offer them internships after which better total cost of ownership than stay with the company. We currently have 26 students with us as part of this program, and another 25 on what is called social services supported by universities.

Can you provide more detail as to how Skyworks Solutions has incorporated innovation into their Mexicali operations?

Around five years ago, we established the benchmark agreement initially started with Skyworks in Mexico. This was in response to study we conducted that showed that the market was not being served by the domestic market and was not being served by the country was not the type of work that was needed by the industry. We invited students and professors from all over Mexico to come together at Skyworks and focus on what was really required for industry to progress. Today, we work with universities and government and today we are seeing that the right technology is going to be and where it will take us. We encourage innovative thinking and even have our own patent office to protect the constant stream of new ideas.

How is this being applied in the aerospace sector?

Skyworks Solutions is an active member of the aerospace cluster in Mexicali and is in fact one of only a few companies in this sector. Innovation is certainly a new step for the aerospace industry, but the environment is certainly right for it to succeed. The most important asset is the talent available here in Mexico. For innovation, you need keen minds, and Mexico is in no short supply. With the right education and efficient knowledge transfer, Mexico’s aerospace industry could be competitive internationally. What is the crucial is maintaining that strong link between academia, government and industry.

Do you have a final message for our international audience?

It is an exciting time at Skyworks. Our solutions enable a number of applications within the critical infrastructure, connected home, industrial, medical, aerospace, smartphone and wearable markets. In Mexicali, we continue to expand and increase our capacity to meet this growing demand. We are very customer-centric with quality, cost and productivity all key elements of our success. Our growth is fuelled by the wealth of talent available and the people’s collective determination to succeed. Today, our presence is the greatest strengths and what the international aerospace community needs to know.
Can you give a brief introduction to Orcon and the history of the company? Orcon was established in California as a private company and has been in business for 53 years. The company started to gain some fame due to its expertise in fabricating insolation blankets. In the beginning, the operations in Mexico were under the umbrella of the U.S. parent company. The company went through the transfer of the first work package in 1996 with the use of software. Our team was able to reduce the material thickness by 20%, while maintaining the structural strength required for high-strength, low-alloy material, which is essential for the progression of the country’s aerospace industry. Government and universities must work collaboratively to grow the pool of skilled labor and help Mexican companies break into the aerospace supply chain. Doing this will create a sustainable ecosystem.

What is your experience of expanding to Mexico and what are the key factors that are currently preventing companies from establishing a presence in Mexico? There are definitely some gaps in the supply chain, particularly with heat treatment. We have had some success with some of our customers in the United States by developing this service offering in Mexico, which is still in the discussion stage. The main factors that are currently preventing companies are the understanding of the business community and the language barrier. It is very important that our customers understand that we are not simply a supplier of metal forming and fabrication products, but we offer substantial design and engineering support. We are looking for customers interested in research and development that are constantly developing new products, and as such need support from a design and manufacturability perspective. This is where our engineering team can add significant value.

Can you identify some key challenges and opportunities in the Mexican aerospace market? When direct design started to play a larger role in Orcon’s operations in Mexico, our manufacturing operations in Mexico and in the United States are mirror facilities that both offer punch press, four slide, and tooling capabilities. In addition, most of our spring, CNC wire forming and value-added assembly operations are in Mexico. Bazz Houston’s latest acquisition is a precision sheet metal fabrication facility in Cali. Strategically, this complements our current manufacturing capabilities and is one that our customers need as they are asking for it. This will also strengthen our efforts to reduce cost and generate savings to the customer of over $1 million per year, for which we received the 2013 Innovation Supplier of the Year Award. This is a great example of how Bazz Houston can not only provide quality services, but can also implement considerable cost savings for our customers both in the United States and in Mexico.

What are the benefits of bringing in a for- eign company to implement lean initiatives? Bringing in a foreign supplier makes for a quick solution to any gap in the supply chain. A company with previous experience from another country will have the mature internal structure to swiftly establish efficient operations. Developing a purely local lean implementation and investment, but it is this long-term development that is essential for the progression of the country’s aerospace industry. Government and universities must work collaboratively to grow the pool of skilled labor and help Mexican companies break into the aerospace supply chain. Doing this will create a sustainable ecosystem.

What gaps have you identified in the local supply chain and what is preventing companies from establishing a presence in Mexico? There are definitely some gaps in the supply chain, particularly with heat treatment. We have had some success with some of our customers in the United States by developing this service offering in Mexico, which is still in the discussion stage. The main factors that are currently preventing companies are the understanding of the business community and the language barrier. It is very important that our customers understand that we are not simply a supplier of metal forming and fabrication products, but we offer substantial design and engineering support. We are looking for customers interested in research and development that are constantly developing new products, and as such need support from a design and manufacturability perspective. This is where our engineering team can add significant value.

Can you elaborate on the process that Orcon went through for the transfer of the first work package? The transfer was a very interesting process, but Orcon has been in the military business for a significant amount of time. The company developed all the regulatory requirements and signed the proper contracts with the original equipment manufacturers (OEMs). Transfer was difficult in the beginning, but the process did go well. After the first work package transfer, Orcon developed other projects with major players in the military industry. In the Mexico facility, the company is currently building military products for three or four major players.

Can you explain the process of acquiring certifications and customer approvals? In the beginning, the operations in Mexico were under the umbrella of the U.S. parent company’s AS 9100 certification. Orcon then certified the Mexico facility for AS 9100, and we have kept this certification for all the years that we have been operating in Mexico. What helped with the certifications is that our corporate office oversees the quality in the Mexico facility. The corporate office makes sure of all the requirements of its customers, and we then adhere to the requirements from the corporate office. The facility has also earned some awards of years. Quality and on-time delivery is a big driver in the industry.

What procedures has Orcon put in place for lean manufacturing? Orcon has been working with its customers ever since the beginning. In the facility there is a significant amount of communication on the floor. During shifts, the progress of production is monitored every hour. Shifts are started by communicating the products that they are manufacturing. Understanding the products and what it means to be involved in the aerospace industry creates a sense of honor in the company’s staff members.

What are some of Orcon’s flagship projects? The patents that Orcon has are mainly for a major OEM. The company has several products qualified for this OEM’s QPL. Aircraft can only have products incorporated that have been preapproved. Orcon has a different market, as the company sells not only to the maintenance, repair and overhaul (MRO) companies. One of Orcon’s biggest customers is the MRO business and operators.

What was the first work package? The first work package was for the U.S. military, specifically for the F-35 program. This was not our initial area of focus we quickly identified the great opportunities that this facility had. We were certainly helped by a number of factors: many of our key personnel are bi-lingual, Tijuana is just two hours from our main facility in Garden Grove, and our key customers were very supportive. Our Mexico facility is located in La Mesa Industrial Park, and it is both AS9100- and ISO9001-registered. Can you provide an overview of Bazz Houston’s history? Bazz Houston was founded in 1961 in Long Beach, California, and started manufacturing mostly springs, stamping and slide products. In 1974, the company moved to Garden Grove, where its corporate offices are now located. We expanded our operations to Tijuana, Mexico in 2004 to better serve our customers with operations in Mexico. Our manufacturing operations in Mexico and in the United States are mirror facilities that both offer punch press, four slide, and tooling capabilities. In addition, most of our spring, CNC wire forming and value-added assembly operations are in Mexico. Bazz Houston’s latest acquisition is a precision sheet metal fabrication facility in Cali. Strategically, this complements our current manufacturing capabilities and is one that our customers need as they are asking for it. This will also strengthen our efforts to grow our business with our aerospace customers.

Can you talk about your experience of expanding to Mexico and provide details of the facility that you have here today? Expanding into Mexico was definitely a challenge and was not an easy decision. A number of factors influenced us at that time. Several key customers encouraged us to expand our operations in Mexico and, after extensive investigation, we proceeded. We made the decision not to use a shelter company, but rather establish operations with our own resources. Although aerospace was not our initial area of focus we quickly identified the great opportunities that this sector offered in Mexico. We were certainly helped by a number of factors: many of our key personnel are bi-lingual, Tijuana is just two hours from our main facility in Garden Grove, and our key customers were very supportive. Our Mexico facility is located in La Mesa Industrial Park, and it is both AS9100- and ISO9001-registered.

What is the typical customer profile that Bazz Houston is seeking to work with in Mexico? The primary customers that we are targeting are ones that fit our strategic profile. We want to work with companies who value the engineering support that we provide. It is important that our customers understand that we are not simply a supplier of metal forming and fabrication products, but we offer substantial design and engineering support. We are looking for customers interested in research and development that are constantly developing new products, and as such need support from a design and manufacturability perspective. This is where our engineering team can add significant value.

Can you provide an overview of Bazz Houston’s operations in Mexico? Bazz Houston went through a major expansion in 2004, when the facility in Tijuana opened. This facility has also earned some awards over the years, including the Alianza Award. This is a great example of how Bazz Houston can not only provide quality services, but can also implement considerable cost savings for our customers both in the United States and in Mexico.
Can you provide an introduction to MTI de Baja with a brief history of the company? MTI de Baja began in 2005 with fabricating thermal acoustic insulation blankets for a primary aerospace customer in Canada. Early on, the company’s network began asking about machining capabilities in our region of Baja California, Mexico. We found a local operator of machining services and with whom we were able to subcontract these requests, and MTI de Baja began in 2005 with fabricating thermal acoustic insulation blankets for a primary aerospace customer in Canada. Early on, the company’s network began asking about machining capabilities in our region of Baja California, Mexico. We found a local operator of machining services and with whom we were able to subcontract these requests, and MTI de Baja began in 2005 with fabricating thermal acoustic insulation blankets for a primary aerospace customer in Canada.

Having initially struggled with machining, how does MTI de Baja today guarantee the quality and on-time delivery of its machined products? Crucially, we implemented AS9100C throughout our entire company. Beyond this MTI de Baja is very process-driven. From request for quote and inception of a product, we take time to identify exactly how we are going to manufacture the product, how we are going to inspect it and ensure consistent compliance. We engage in failure-mode analysis and carry out this management and risk mitigation up-front to ensure that no issues are encountered later on in the process. These measures allow MTI de Baja to guarantee consistent quality and on-time delivery.

Over the next five years, what are some of the major goals that MTI de Baja hopes to achieve in your growth? MTI de Baja will focus on its growth primarily on the Mexico side of the border, supporting companies from the automotive and aerospace industries. We hope to build the business to a point where we can begin bringing companies from the automotive industry grows, American Autoclave is also providing installation and repair services to the industry. We have our own maintenance team in Mexico that travels across the country to provide services to our clients. Therefore, we are not in Mexicali, but most of the structure manufacturing companies are in Northern Mexico and we are still able to service them.

As Mexico’s aerospace industry grows, can Mexicali become a global center of excellence for composite manufacturing? There are significant amount of companies looking at Mexicali in terms of setting up composite manufacturing facilities. I know of three large companies that want to set up in Mexicali to manufacture airplane parts. One of the companies wants to manufacture a complete airplane in Mexicali. In the next five years, Mexicali is going to see tremendous growth in terms of manufacturing for the aerospace industry. Mexicali can offer the technology, support and engineering that are required to successfully operate in the industry.

What goals does American Autoclave hope to achieve in the next five years? American Autoclave aims to have its manufacturing operation established in 2016. We will, however, not only be focusing on Mexi- cali, as we are looking to set up shop in Querétaro in the future. There are several aerospace companies in Querétaro, but they are not doing any material manufacturing operation. As an aerospace industry grows, American Autoclave will like to take advantage of the opportunities.

Do you have a final message to the international aerospace community about Mexi- cali and its growth in the industry? Mexicali can offer good technologies and support. If a company wants to invest in an area where there is good labor, experienced and quality, Mexicali is the region to invest in.

Can you provide more detail about the autoclave itself and how its role has evolved in the aerospace industry as composites become a much stronger aspect of this sector? Carbon fiber is used to manufacture parts. The process involves putting carbon fiber in a mold, which is then covered by a bag. The bag with the mold is then put inside the autoclave where it is pressurized and processed for about 10 hours. Under high pressure and temperature, the carbon fiber becomes a strong solid part. This part is very light, non-corrosive, and easy to repair. Being much lighter than metals, these parts are important in the aerospace industry and have a substantial amount of benefits for long-distance flights.

Can you provide a brief overview of American Autoclave and the history of the company? American Autoclave has been in operation for 50 years and the company’s main focus is the aerospace industry. We manufacture autoclaves used for composite manufacturing for aircrafts. Over the last 10 years, the demand for airplanes has increased by 70% of planes are made out of composites.

American Autoclave has a presence around the globe and distributes its products in Europe, South America, United States, Mexico, and Canada. The company has two production facilities in the United States, of which the main facility is in Georgia, one facility in Brazil, and one in Columbia. The largest sized autoclave that we have manufactured in the U.S. facility is 7 meters in diameter by 25 meters in length. This manufacturing was done for Gulfstream Aerospace. When did the expansion into Mexico come about and what were the initial opportuni- ties American Autoclave identified in the country? American Autoclave in Mexico was set up in August 2015, as it identified many business opportunities in Mexicali. Mexican companies started to grow significantly in terms of aero-structures, as many American and British companies started to set up manufacturing facilities in the country. These companies include GKN, UTC, Honeywell, LMI, and Gulfstream. The reason that several companies expanded into Mexicali was that labor is significantly more economical than in the United States, and the workforce is talented. There are several academic institutions in the region that produce high technically qualified people.
Barry Avenue Plating Co. has 120 staff members working on two shifts. Barry Avenue Plating Co. has appr ovals from all major original equipment manufacturers (OEMs) and offers over 55 finishes, all of which are NADCAP-certified. Barry Avenue Plating Co. faced during the migration process was in 1999. The company registered for AS 9100 certification in the first year one could register, but conformed to the certification requirements before registration was possible. Quality has always been a major focus at Allied Tool & Die.

Can you elaborate on when Allied Tool & Die expanded into Mexico and what opportunities did the company identify in the region? In 2008, there was the financial crisis and at the same time the company had machines that it wanted to replace. As not to sell off the older equipment at a loss, Allied Tool & Die had to respond quickly. For five years, Honeywell had been asking us to open a shop in Mexico, as we have been a major supplier to them. Honeywell is the company’s largest customer and we supply to 18 different Honeywell divisions globally. We have done NADCAP audits in this facility available machines and collaborate with Honeywell as to secure enough business to make the move to Mexico beneficial. The company officially opened the facility in Mexico in July 2010 and started to ship parts by October 2010. Currently the main focus of sales is still for the Honeywell contract, but the company has added other customers, contracts, and products to the Mexico facility.

Can you explain the capabilities and certifications of the facility in Mexico? In Mexicali, Allied Tool & Die has almost duplicated, on a smaller scale, what is offered in Phoenix, Arizona. The facility in Mexico has CNC machining, which includes 3- and 4-axis mills and lathes. Cutting, grinding, welding and NADCAP certification is essential to be able to work in the aerospace industry in Mexico. Companies must get process approval for what is required from customers. Currently there are gaps in the local supply chain. The major problem is that there might not be enough business in the region to provide the investment needed to invest in a. The second challenge is the long process involved with gaining certification and customer approval.

What does goals BAP Aerospace de Mexico hope to achieve over the next five years? From 2014 to 2015, BAP Aerospace de Mexico has tripled in size and will seek to maintain continued year-on-year growth. We are constantly looking at expanding into new process lines that may be required by our customers. From early 2016 BAP Aerospace de Mexico will be offering non-destructive testing (penetrant inspection) services.

How does the company source raw materials? The vast majority of raw materials are purchased through distributors or through the mill. There are a few customers that supply the raw materials. Everything for the aerospace industry that the company buys in Mexicali comes from the United States. Allied Tool & Die’s material volume of $500 million dollars is large enough that we can source the supply of raw materials through diverse suppliers and specialize in high-temperature alloys.

What are the what are the challenges that are preventing companies from entering the Mexican market? The biggest challenge, especially for tier-two companies, is that they do not have a package large enough to justify the move to Mexico. In order to expand and build a supply chain from Mexico, the original equipment manufacturers have to drive it and offer the support needed. We are in the position of support from the shelter provider that we pay to help the company operate in Mexico. The government support that most programs tend to favor larger companies that at our size we could not benefit from. What are Allied Tool & Die’s goals and plans for growth in terms of the aerospace industry? Allied Tool & Die has goals for growth of 5% to 10% year-to-year growth. The caveat to those goals is that we will not grow unless there is a profit in it. No one wants a supplier that is not financially sound enough to survive the ups and downs of business cycles. If we can provide products at a competitive price, with the best quality and delivery, we will get the work.
Can you give a brief history of Anodimex and any recent major milestones?

Anodimex is special-process company offering a range of anodizing operations in Mexico, but this is not the case for most small and medium-sized enterprises (SMEs). This provides a catch-22 for potential customers and work with them to establish what they require and how the company can deliver on their requirements with the ISO certification, which Anodimex also has. The first nine years we spent identifying and understanding the precise requirements of the certification. At the time there was much confusion in the industry in Mexico as to what these exact requirements were.

The way in which Anodimex addressed this was to approach directly our potential customers and work with them to establish what they required and how the company could deliver on the requirements with the ISO certification. Companies such as Eaton and Zodiac were able to then guide us through the process. Once we had a system in place, we embarked on a two-year period of gathering all the necessary documentation and work required by the auditors. Eventually, we had a successful audit over a period of eight days.

What challenges do other companies in Mexico face in obtaining the required certifications?

The largest challenge for Anodimex was ensuring that we had a constant flow of business during the two years prior to the audit, which provided sufficient records for the inspectors. Luckily, we had a strong relationship with Zodiac, since the company began operations in Mexico, but this is not the case for most small and medium-sized enterprises (SMEs). This provides a catch-22 for potential customers and work with them to establish what they require and how the company can deliver on the requirements with the ISO certification. Companies such as Eaton and Zodiac were able to then guide us through the process. Once we had a system in place, we embarked on a two-year period of gathering all the necessary documentation and work required by the auditors. Eventually, we had a successful audit over a period of eight days.

Can you talk through the process of achieving NADCAP certification?

Achieving this certificate was a very long process. It began as a natural progression for us as our business was focused on the aerospace sector, and we must have all the necessary accreditation. In 2000 the NADCAP certification started becoming more and more enforced in the aerospace industry, and we had the same case progression with the ISO certification, which Anodimex also has. The first nine years we spent identifying and understanding the precise requirements of the certification. At the time there was much confusion in the industry in Mexico as to what these exact requirements were.

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NADCAP certification has been another major roadblock for Platinadora. When Platinadora started considering to enter the aerospace market, the company had already had a substantial amount of work within the sector. Now that the company has earned certifications, it does not need to be taken under-the-arm by our customers, but can now walk on our own. Over the years Platinadora Baja has earned the trust of its current and new customers, and what has been very busy in the aerospace market.

Adding all our facilities, the company currently employs 450 people. In the aerospace facility alone, Platinadora has 70 to 80 employees. A significant amount of the employees are working in the quality, engineering, testing, and laboratory fields. The number of employees in this facility speaks to the importance of our enterprise in the aerospace industry.

What are the typical finishing needs of the aerospace industry?

Currently Platinadora Baja has focused its attention on the connector niche of the industry. The company does a significant amount of electroless nickel plating, which includes mid-phosphorus and high-phosphorus solutions. Platinadora Baja also does cadmium plating for the military, as this finish provides a very high resistance against corrosion and has excellent performance qualities. The finishes offered are olive drab or military green, yellow and clear chromat.

The use of cadmium is decreasing as the use of this metal has some environmental restrictions. Platinadora, however, has very strict regulations and pollution control in our plant to prevent contamination and unnecessary exposure to heavy metals. The company makes it a policy to neutralize, properly treat, and dispose of metal finishes.
Please provide a brief history of SINCO and its recent major milestones?

Connections were made with companies in the US that needed more economic ways of securing machine components, and as a precursor to SINCO’s formation, I began sub-contracting to local companies in Mexico. SINCO was formed in 2006. With numerous contacts in the US, SINCO commenced operating in Tijuana via third party machine shops supplying materials and parts, QA processes for planning and heat treatment, plus the export and logistics for distributing these parts. Some machine shops lacked work-quality and on-time delivery so it was only a matter of time before SINCO started its own manufacturing operation. In 2010, SINCO started a partnership with MAIS Industries LLC and we have grown over 30% every year since then.

Due to the unreliability of local outsourcing, SINCO commenced carrying out all its own manufacturing processing at its Tijuana facility. Recently we have begun using Barry Avenue Planting in Tijuana to carry out SINCO’s secondary process of plating and anodizing. The aerospace industry is important to SINCO’s future; the company is evolving into more competitive markets, manufacturing more demanding components and implementing enhanced quality systems. To introduce SINCO’s service offering to new companies that require higher quality systems, SINCO has self-initiated the implementation of AS 9100 certification.

What is SINCO currently carrying out for the aerospace sector?

SINCO has drilled aerospace fasteners, mainly for engines, working with the following companies: B&B Fasteners, Air Industries, 3V Fasteners, etc. SINCO also manufactured components for ITW, e.g. aerospace floating nuts for fuselage assembly. However, the company wishes to progress beyond this specific market and look at different sectors of the aerospace industry to encompass larger components and different materials, i.e. structural airplane components, hydraulics, landing gear, complementing the company’s impending AS 9100 certification.

Does SINCO employ a design engineering team?

SINCO does not offer design as part of its manufacturing processes but it will identify a manufacturing risk that contravene AS 9100 certification. Myself, and the production manager are engineers, and the company’s five programmers have a high technical level of engineering also enabling them to advise on design modifications.

Are there sufficient heat treatment facilities within the Mexican aerospace supply chain?

Arguably, there is no reliable heat treatment facility locally. SINCO outsources to the US. Options to set up a company have been considered by SINCO to fill the void of specialized processes in Mexico. It is considered by US specialized process companies that there is insufficient work in Mexico to establish a presence in the country.

What are SINCO’s goals in Mexico’s aerospace industry within the next five years?

To gain AS 9100 certification, anticipated for October 2016. The company will then be able to fully utilize its high-tech equipment which will be continuously updated to fill the needs of existing and new customers.

Do you have a final message for the international aerospace community?

The Mexican government is supportive of the aerospace sector; the country has extensive technical centers to sustain this industry; and Mexico’s aerospace sector is booming and will receive continuous support to maintain its growth. •

Can you provide some background on Coast Aluminum with a brief history of the company?

This concept of aluminum distribution began under the name of Clark Metals in the 1960s. In the 1980s the company was sold, and Coast Aluminum was founded in Hayward, California. After opening several branches in the United States, it was decided to expand into Mexico. We started operations in Tijuana in 2008 and have since then been involved in the aerospace, automotive, and electronics industries. The regulations within the aerospace industry demanded that we become AS-certified. Today, in addition to our Tijuana facility, Coast Aluminum has warehouses in Ensensol and Hermosillo. We are actively looking to continue our expansion in Mexico.

What were the initial opportunities the company identified in Baja California? Coast Aluminum saw a gap in the market in Mexico. There was no other company at the time providing our services. We had existing customers in the region and felt that it was important for us to move to be close to them. We established our Tijuana warehouse under the maquiladora program, which means we are not required to pay duties on our imports.

What are the typical metals you are supplying the aerospace industry? We supply different types of alloys for aluminum and stainless steel. We have some other metals alloys that go to the aerospace industry such as 2024, 7075 alloys.

Do you have in any in-house processes that support your products? Yes, we have several cutting machines in our facility. We are able to cut all our products to our customers’ specifications.

Can you tell us more about the process you undertook to receive the AS certification and what some of the biggest challenges? We received support from the aerospace association FEMIA and it took around a year to become certified. We had to start from scratch and design all our procedures and quality control to these standards. At the time when we began the process of becoming certified we were in a period of substantial growth. We had recently hired a number of new staff and were focused on training them. The biggest challenge for us was finding the time to create our quality control procedures needed for the AS certification.

As a company that imports all of its products from the United States, how have you found the process of bringing metals across the border? From when we began until now we have seen some change in this process, but it is still a slow one. There have been some efforts to change the laws to make it a more efficient procedure and there are no problems we do not have any trouble. For other materials though such as steel we have to apply for additional permits. This adds another five days to the wait at the border. To offset this time we stock considerable inventory in our 50,000-square foot warehouse and try to predict what our customers’ demands will be.

What is preventing there from being a stronger base of suppliers of raw materials operating in Mexico? It is very difficult to become a supplier of raw materials for the aerospace industry. Beyond AS certification you also need specific customer approvals. If a company wants to open a warehouse in Mexico they need to be guaranteed that they will get business. As Mexico’s aerospace industry is particularly new we have yet to see more distributors, but I believe in time we will.

Are companies getting enough support from either the cluster or the government? Yes, there has been considerable help from the government and the clusters with regards to certifications. The biggest change is a program where the government is now providing a technical advisor to the company to help with the certification process.

How important is the aerospace industry for Mexico? The aerospace industry is important for Mexico. The strict rules that it enforces are a good training platform for our people. It is helping to develop a highly qualified workforce. Now that we are progressing in the aerospace industry, not as many of our young engineers are being exported to more mature aerospace industries overseas. •
How important is the aerospace industry in Mexico for Ryerson?

In terms of business percentage the aerospace industry means that it is often difficult for a company to have a high enough level of business to justify a migration.

Do you have a final message?

Ryerson is seeking to grow in the aerospace sector. Looking ahead we need to establish strategic relationships with mills that are able to supply us with the materials needed for this industry. We must also create quality teams dedicated to aerospace. For Mexico, we are looking at diversifying not only in our product offering, but also in the industries that we serve. The past five years have been very successful for Ryerson in Mexico and we will continue to be engaged in the aerospace industry and actively exploring how we can evolve to better meet its needs.

Can you give a brief overview of Electro-Mech and the history of the company?

Electro-Mech was established in 1963 in Los Angeles. The president of the company, Walter Trumbull, was one of the first Americans to be part of the maquiladora program. This program provided the opportunity for foreign companies to enter Mexico and establish companies in the country without paying duties on imports and about zero income tax. This helped to promote investment in Mexico.

Can you elaborate on how the Maquiladora program has evolved within the aerospace industry?

From a government perspective, there is much emphasis about the growth of the aerospace sector. In the past, many companies were already doing work in the aerospace industry, but the industry was not recognized as a sector on its own. With the boom in the aerospace industry, the government is now recognizing the importance of this sector. The Maquiladora program was developed for any type of manufacturing. The natural next step is to develop a program specifically for the aerospace industry. Currently the Maquiladora program is difficult to manage. Within this program, there are so many fiscal requirements that even small companies to follow these rules. The government can create something better that is not as difficult to comply with.

Is design playing a greater role in the Mexican aerospace industry as of the Maquiladoras evolving?

Design is definitely starting to play a greater role. Within Maquiladoras, everyone goes to the cost of operation. Now the same thing can be designed and produced, but at less costs. Design is being incorporated in the Mexican facilities as the machines are here directly with engineers to the product can play an important role. With proximity to the product, engineers can have a better understanding of the operations.

What are some of the major goals Electro-Mech would like to achieve in the next five years?

Electro-Mech can guarantee high quality products at great costs. The goal is to work directly with engineers as to identify needs and demands in the market. The aerospace industry is now moving towards using composite materials as to make parts lighter. For this sector we would like to make thinner, smaller and lighter products to exceed our customers expectations.
How does the IVEMSA’s business model work and what are the key services that the company provides?

IVEMSA helps companies to set up their businesses in Mexico as to make sure that these companies have a soft landing and accomplish successful and productive operations in the Baja region and targeting the global supply base of our exciting customers.

How does IVEMSA identify the needs in the aerospace industry and what is your strategy to attract new companies to Mexico as to meet the demands of the industry?

IVEMSA puts together and attends various seminars so as to identify industry demands and is very important to attract new companies. We also have a marketing structure where we generate our own leads and do not wait for the government to develop those leads for us but we cooperate with it in its efforts to attract investment. We truly believe in doing teamwork with governments for a greater good, which is economic development that benefits our different regions. Pro-México also offers help and referrals from companies that are very important in attracting new companies and developing the supply chain in Mexico. Suppliers are not only sourced from abroad, but in some cases we will look at local companies to develop the supply chain. IVEMSA aware of this need to retain existing companies’ and by the retaining of the process is to identify suppliers that meet the requirements of our customer’s operations in Mexico.

Do you have a final message for those interested in doing business in Mexico?

We manage GKN’s and our customers’ daily activities so that they can fully concentrate on technical issues, production, quality and schedule. Managing the day-to-day operations of the business is a priority. The EDC consisting of the Paris Airshow, for which there is a significant amount of doors for CaliBaja to open. The image that the region has in terms of safety and security. One of the biggest challenges is to attract new companies to the aerospace industry and bring new investment. Currently, there are gaps in the supply chain for heat treatment and special processes, and the EDC tries to fill them with companies that are interested in being part of our aerospace industry ecosystem.

What type of relations does the EDC maintain with its counterpart in the United States as to facilitate exchanges within the CaliBaja region?

The CaliBaja Region initiative is something that has been in the works for about six years. Companies that first entered Tijuana were merely for the purpose of a cost-reduction strategy. As to follow up on the cost-reduction strategy, the EDC and its U.S. counterparts have to collaborate. How do we overcome these obstacles?

What hurdles did the organization have to face while it was an emerging company in Mexico, and how did it overcome those obstacles?

The EDC compiles industrial information about Tijuana that is required by potential investors for their feasibility studies. The information gathered by the organization is free of cost. The EDC is also involved in retention and expansion activities. This means that the organization does link activities between companies, schools, government, and suppliers.

In simple terms, our main job is to assist companies who are interested in setting up operations in Mexico.

How is the aerospace sector been for the EDC and how has the organization contributed to the growth of the sector?

The EDC focuses on four primary industries, which are medical-device manufacturing, electronics, aerospace, and automotive. In terms of the general aerospace environment in Tijuana, the organization is approached by companies that are already in the region for their expansion purposes. The EDC tries to incorporate these companies in our activities so as to bring them more business opportunities. The organization works on both nurturing the existing industry and bringing new investment. Currently, there are gaps in the supply chain for heat treatment and special processes, and the EDC tries to fill them with companies that are interested in being part of our aerospace industry ecosystem.

What are some of the biggest challenges when helping to establish a company within the aerospace industry in Mexico?

IVEMSA was established in 1982 in Mexico, particularly Bajío area, with the idea to diversify the company. IVEMSA is a well-diversified company and is mainly focusing on the aerospace industry and the automotive, and IT industries. Within our base of different customers, we have identified great opportunities in the aerospace industry. IVEMSA did a complete analysis of the Baja region and identified that the aerospace industry was not completely developed and was still a growing industry compared to other industries that were almost absolute. Tijuana is constantly developing programs, advice to succeed is readily available. Tijuana offers help and referrals from companies that are very important in attracting new companies and developing the supply chain. Suppliers are not only sourced from abroad, but in some cases we will look at local companies to develop the supply chain. IVEMSA aware of this need to retain existing companies and by the retaining of the process is to identify suppliers that meet the requirements of our customers’ operations in Mexico.

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“Chihuahua’s division for aircraft equipment forms Safran’s largest operation, with 7% of all Safran Group’s employees at the Chihuahua site. We ship half a million harnesses a year to our customers, making us the largest wiring facility in the world.”

- César Díaz de León, Director of Operations, Safran Labinal Power Systems Chihuahua
Quickly soaring to new heights, Chihuahua’s aerospace industry proves that Mexico offers potential for development and competitiveness in facets far beyond affordable labor. Recognized as one of Mexico’s most promising hubs for expertise, Chihuahua City established as many as 36 aerospace factories in a five-year span between 2008 and 2013; the grand total has since expanded to include five original equipment manufacturers (OEMs) and 37 certified suppliers.

History

The city of Juárez, located on the El Paso-Texas border, was the headquarters of Mexico’s maquiladora ascendancy in the 1960s. Juárez was home to one of the first industrial parks serving major international automotive and electronics brands. The industrial background and mechanistic culture of the state provided a sturdy foundation for the transition into aerospace, which was set in motion after Luis Lara seized an opportunity granted from a single acquisition.

Lara initially had a difficult time catching the attention of the international aerospace community. “We managed to convince a company in the defense sector,” he explained, “and a plant was built to supply the F-16 Fighting Falcon.” Through General Dynamics and its subsidiary Aerotek, Lara built to supply the F-16 Fighting Falcon.”

Foundation of Strong International Players

Housing five of the seven OEMs that are present in Mexico, including Cessna, Beechcraft, Textron International, Honeywell aerospace, and EZ Air Interior Ltd., Chihuahua’s facilities are notably larger in comparison to other Mexican operations. Occupying over 2 million square feet (sq. ft.), Honeywell’s presence in Chihuahua is undoubtedly leading the trend of expansion for aerospace in the city. With 1,200 computer numerical counting (CNC) machines, Honeywell has the largest concentration of high-precision machines in Latin America. Specializing in turbine parts and components for commercial and military aircraft, Honeywell also recently opened its new engineering design center for automotive and electronics at the close of 2015.

“Honeywell’s expertise in this facility could be transferable to applications in the aerospace sector,” notes Sergio Almada, marketing and business development manager of Intermex Industrial Parks, the company supplying Honeywell with its new real estate. Cessna was the first company to initiate aerospace patent registration in Mexico and is another major client of Intermex. Occupying over 1 million square feet (sq. ft.) of assets, Cessna Chihuahua is actively involved in composite processes, but mainly creates harnesses for electrical systems and conducts sheet-metal machining. Cessna constructs around 90% of the Corvalis plane from its facility in Chihuahua. Merged under the title Textron Aviation, Cessna and Beechcraft both produce structural components for fuselages, wings and aircraft cabins.

Textron International, however, is currently generating and assembling more than 60% of the complete Bell Helicopter from its Chihuahua location. This particular facility, which opened in 2009, focuses on assembling the Bell 412 and 429 helicopters, the demand for which remains steady. “The selection of the 412 by the Japan Ministry of Defense illustrates the demand for proven and reliable aircraft,” explained Luis Ariza, general manager of Textron International Mexico. “Also, the Bell 429 had another strong year, with over 50 deliveries, particularly in the para-public and emergency medical services segments.”

From start to finish, a Bell 429 aircraft takes about 3,000 man-hours to complete before it can seek certification. Bell Helicopter hopes to magnify its branding as innovation experts in the rotorcraft industry by introducing new models, such as the 525 Relentless and 505 Jet Ranger X. Any activity that takes place in Chihuahua concerning the new aircraft will likely have a focus on structural elements, a theme very prominent in the overall aerospace activity of Chihuahua.

Interiors is another noticeable concentration of Chihuahua, exemplified by the unique establishment of EZ Air Interior Ltd., a joint venture between Zodiac Aerospace and Embraer. Formed in 2012 with the goal of consolidating interior parts production, EZ Air Interior was erected in proximity to the already successful Zodiac Chihuahua campus, which consists of nine different operations divided across five impressive plants. The uniqueness of this OEM’s functionality is that the supplier and the client are both owners of the company, and its parents are among the largest aerospace companies in the world. EZ Air Interior manufactures all interior parts of the aircraft, except the seats, from start to finish, 90% of which are exported to Brazil. “The next few years are going to be a consolidation period of philosophy and mindset. Embraer aims to deliver the first E2 aircraft in the beginning of

2018, of which all the interior parts will be manufactured in Chihuahua,” explained Luis Carlos Ramírez, general manager of EZ Air Interior.

The electrical wiring design for the Boeing 787 aircraft also originates in Mexico, more specifically from SAFRAN Labinal’s design office in Chihuahua. Though the main focus of design is on electrical and connecting systems, recently, it has become more involved in aerostuctures. “Which is especially positive given the lack of expertise in aerostuctures wiring in Mexico,” explained César Díaz de León, director of operations at SAFRAN Labinal Power Systems.

While technology continues to advance, the demand for electricity onboard aircrafts increases as well. Being light weight and efficient, electrical wiring will replace the hydraulic, mechanical and pneumatic systems of older aircrafts. “SAFRAN sees this as a large opportunity in the power systems area…” This particular division for aircraft equipment forms the largest company of SAFRAN in the world.”

The Chihuahua facility alone ships half a million harnesses per year to its customers and 7% of all SAFRAN Group’s employees are at the Chihuahua sites. Along with the companies in Querétaro, SAFRAN is Mexico’s largest aerospace employer. SAFRAN Labinal Chihuahua’s new plant was inaugurated in February of 2016 and will be developing the wiring for the Triple 7, the 737 and the 8350 aircraft models of Boeing and Airbus.
Jobs are located in manufacturing; in Chihuahua sector, Chihuahua has a vocation of manufacturing decades of workers in the manufacturing industry. Skilled labor is not merely generated by existing resources), state-of-the-art infrastructure, strategic location (right next to two US Border States), tax incentives, and 20% of GDP recorded by Chihuahua is the most FDI in the nation and generate the largest number of annual skilled workers. Chihuahua is the largest number of employees in the 2007 report of the World Economic Forum. Mexico, and there are a handful of aerospace companies operating there. Chihuahua City, 20% of our industrial park space is devoted to aerospace, and growing. American Industries and the government have already set aside space for an aerospace park next to our airport.

What current plans are underway that portray how drastically aerospace will change in the short to medium term? By evaluating different technology packages, the government has a clear understanding of our areas of opportunities. To accelerate the advancement of technology we have invited a group of entrepreneurs to evaluate and invest in the development of the aerospace development. These experts plan to buy international companies and bring them here to supply the local market. Chihuahua has many great business opportunities with even greater resources to buy key components and stabilize operations here. As a government we have been collaborat- ing with the OEM’s such as Boeing, Embraer, Airbus, etc. to understand what is needed for Mexico to have a full assembly plant. This research will focus our efforts on developing the additional airport infrastructure, which will consist of an R&D technology park, an MRO presence, strategic suppliers, aircraft painting, an assembly plant and a demolition and recycling center. Investors and entrepre- neurs, both foreign and local, are already interested in making this idea a reality. The timeline will depend on the market and the MRO integration.

Please give a brief overview of Chihuahua’s current economic situation, and its status concerning foreign direct invest- ment (FDI)? Chihuahua is one of the preferred locations to invest in Mexico due to five main reasons: • Local government focusing on economic development. • Strong economic ties to the US. • Strategic location between the main players of each critical area. • The promotion pillar, the government and trial promoters and the government to enhance the image of our sector. The final pillars are certification and infrastructure. The overall vision is to strengthen the region not only by bringing in additional companies and investment, but also by promoting and pushing the involvement of local companies.

Why is Chihuahua such a competitive investment destination? What types of inter- national companies are already established here? Due to the 45 free trade agreements between Mexico and its allies, we have access to 1.2 billion consumers. Every day, more than 5 million people and 300,000 vehicles cross the border between Mexico and the United States. Chihuahua accounts for 20% of the total crossings, with 11 border crossings and six ports of entry. Chihuahua is an optimal business destination as it is supported by the 57 billion USD investing in our state over the last five years through 185 new investment projects, creating more than 160,000 new jobs, and the lowest rate of informal employment. This is important because it translates into a higher quality of life. The state of Chihuahua has 3.5 million in- habitants, only 3% of Mexico’s total popula- tion, yet we manage to secure the second most FDI in the nation and generate the largest number of employees in the exporting and manufacturing industry. 30% of Chihuahua’s total population is studying in the state. Each year, more than 5,500 engineers and more than 37,000 students skilled in trades gradu- ate from our schools. Though we do not have as many companies as Baja California, we have larger facilities to accommodate the local workforce. Chihuahua’s strong range of industrial clusters consists of over 550 world- renowned companies.

Chihuahua has the largest area of real estate in Mexico, with 80 million sq. ft. of facility space, 7 million sq. ft. of which is still available. Fund is going to build a 1 million sq. ft. engine factory here worth 1.3 billion USD, hiring 1,500 new employees to produce the new generation of engines.

What role does aerospace play in Chihuahua’s economic footprint? The headquarters of Mexico’s entire maquila- dora program was actually located in Juarez, but the aerospace industry started in Chihuahua in 1990 with the establishment of General Dynamics. Fostered by the experience gained from the automotive and electronic sectors, it was an easy transition into aerospace’s ef- ficiency and quality driven processes. Chi- huahua houses one of the most advanced precision machining operations outside of the world belonging to Honeywell, operating more than 1,100 CNC machines in a 400,000 sq. ft facility here in Chihuahua. In the aero- space sector, there are over 35 companies— including five out of the seven OEMs in Mex- ico, accounting for over 17,000 employees. With these new projects, Chihuahua is set to be the largest producer of aerospace manufacturers in Mexico. Juarez is one of the largest manufacturing centers in Latin America, and there is a handful of aerospace companies operating there. In Chihuahua City, 20% of our industrial park space is devoted to aerospace, and growing. American Industries and the government have already set aside space for an aerospace park next to our airport.

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in demand for our services as a result of the Cold War, so I turned to the United States. At the time, Boeing was not interested in establishing itself here or procuring components in Mexico. Airbus began to require harnesses for the Airbus 319 and Airbus 320, and my company, Aerotech, successfully won the bid to manufacture them. Another opportunity arose doing business more logically through Labinal, which was part of a French conglomerate called SAFRAN group and, as a result, I sold my company Aerotech to them and continued facilitating their growth in Chi­huahua from near 500 people in the be­ginning to around 4,000 employees in the area.

After Airbus, we continued on to work with Cessna and started bringing in more suppliers and creating new clusters. We currently have 38 companies with approximately 14,000 people in these clusters, and I continue to construct buildings for these clusters, which was my original business. Currently, Boeing is competing with Air­bus internationally, and Mexico is becom­ing a key player in the global aerospace industry.

Can you elaborate on the maintenance, repair and operations (MRO) project? The primary objective was to bring an as­sembly plant for Airbus or Boeing, both of which went to Querétaro. In reference to cost, maintaining an MRO requires about 50% of labor and 30% of materials; engine overheads require 40% of labor and 60% of materials; maintenance of electronics and components requires 20% of labor and 80% of materials. A company’s main sav­ings come from conducting maintenance, an offset deal for Boeing in Shanghai, because it is in­volving the cost savings from assembling in China for an order coming from the United States. Airbus is turning towards China to reduce its costs and be cost­competitive.

In 1990, Boeing said that they would not consider building anything outside the state of Washington. Almost 30 years lat­er, Airbus has won 35% of world market share and Boeing has lost market share in the commercial aircraft space. Not be­ing competitive has cost Boeing approxi­mately 40% of world market share. We are willing to be their partner and help them reduce their cost in order to improve their competitiveness.

How many new aerospace companies will we see establish themselves in Chi­huahua in the coming year? In the aerospace industry, we are expect­ing two sectors to develop strongly: the first one is the MRO maintenance, which includes fuselage, engines and moving components, and the second one is the pro­vision of components for aircraft interiors. In total, we are expecting approximately six or seven companies to relocate here in the next two years. In the future, we hope to see this number increase, as it is crucial to our business and the continual develop­ment of the local economy.

Do you have a final message for the in­ternational aerospace community? The aerospace business utilizes global manufacturing—Airbus and Boeing are companies founded by Luis Lara back in 1990. Safran has been pioneering the aerospace industry in Chihuahua, the company has expanded its operation from approximately 350 em­ployees in 1998 to 4,316 today. Expansion began almost immediately after buying Lara’s business with the acquisi­tion of 70,000 square-foot (sq. ft.) in the Americas Industrial Park (Parque Indus­trial Las Americas). Three years later, Safran entered the aerospace market in Chi­huahua, the company has expanded the operation from approximately 350 em­ployees in 1998 to 4,316 today. Expansion began almost immediately after buying Lara’s business with the acquisi­tion of 70,000 square-foot (sq. ft.) in the Americas Industrial Park (Parque Indus­trial Las Americas). 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Bell Helicopter’s building is LEED Silver certified, has a clean industry certification from the Mexican authorities, and is certi-
© by DGAC and AS9110. We have an internal certificate of compliance for our electrical harnesses, which are inspected and tested in-house. In 2012, the Chihua-
huau facility received the president’s award for safety performance for Bell Helicop-
ters and Textron. Safety is a key focus, as is lean manufacturing. We are continuously improving quality, safety, and environment.

The Chihuahua facility assembles cabins and electrical harnesses, provides struc-
tural assembly services, conducts electrici-
test, etc. How many employees are on-site, and how do you source the talent to produce such a diverse portfolio?

Bell Helicopter’s manufacturing facility in Mexico is home to approximately 370 workers. The company maintains in-house customized training and certification for manufacturing employees working on the shop floor as part of its operation teams. We can effectively train up to 24 people per shift. Talent is found from a variety of sources, including excellent local institu-
tions such as: Instituto Tecnológico de Chihuahua (ITCH), Universidad Autóno-
ma de Chihuahua (UACH), Universidad Politécnica de Chihuahua (UPCH), insti-
tuto Tecnológico de Estudios Superiores de Monterrey (ITESM), Universidad La Salle. Cadena also played a very important role during the start of our operations, as many of our employees were trained at that cen-
ter. Additional talent has also come from other parts of the country. Furthermore, we offer an internship program to help develop and promote young engineers and techni-
cians.

What products and services are pres-
ently in greatest demand?

The long-term view of the rotorcraft indus-
try remains positive. We expect 2016 and 2017 to be like 2015 and remain relatively 
that. Yet we expect the market to pick up at the 
tail end of 2017 into 2018.

Is there anything currently in develop-
ment that will enhance production? 

Bell Helicopter has a very active R&D department. As part of its pursuit of excellence and con-
tinuous improvement culture, Bell Helicopt-
er is constantly looking for opportunities to incorporate ‘autonomation’ into many of its operations. Automation is the right level of automation with human-operated tools. Since one of the most repetitive jobs is getting 
drillings on composites, the company is creating a station that will allow it to drill 
and control the depth, orientation and precision in combination with the human touch, to increase productivity and quality, while making it safer for the operators.

The goals for 2016 include limiting acci-
dents, reducing DPA, minimizing scrap, focusing on time completion and delivery, reducing down time and hours per aircraft, training and developing of employees and realization of 99.2% employee retention. Though we can increase our output, Bell Helicopter is currently meeting our cus-
tomer demands.

Where does Bell Helicopter hope to be in the next five to ten years?

The Bell 429 also had another strong year, 

modern aircraft that can serve multiple 
categories. Bell Helicopter is upgrading existing 
and has an impressive industrial history, 
as it has been involved in the development of the 
and aero evacuation systems plant is the only 
while making it safer for the passengers.

The Chihuahua facility is currently one of the leading facilities in Bell Helicopter. Bell Helicopter has a very active R&D department. As part of its pursuit of excellence and continuous improvement culture, Bell Helicopter is constantly looking for opportunities to incorporate ‘autonomation’ into many of its operations. Automation is the right level of automation with human-operated tools. Since one of the most repetitive jobs is getting drillings on composites, the company is creating a station that will allow it to drill and control the depth, orientation and precision in combination with the human touch, to increase productivity and quality, while making it safer for the operators.

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Where does Bell Helicopter hope to be in two to five years?

Among over 100 sites around the world, 
Chihuahua’s campus is now the biggest site of Zodiac Aerospace, and Mexico is the third largest country site after the United States and France. Chihuahua has the most Zodiac Aerospace employees, which number around 3,000 people, not counting EZ Air Interior Ltd., the joint venture between Zodiac Aerospace and Embraer. Our 
entertainment systems plant is the only 
prove aircraft performance?

Through what means of innovation is 
definition of our future? Material choice is a strong driver. Replac-
ing metal parts with composite parts when 
possible reduces weight, while making it easier to manufacture and to maintain. It also has an impressive industrial history, as it has been involved in the development of the most 
how the work-pool is drying, we need to work 
whether or not the human capital will ex-
cert. Last year, 150 people to 200 people 
with the authorities to bring more people 
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EZAIR INTERIOR LTD.

Can you give a brief introduction to EZ Air Interior Ltd. and how the company has evolved since its establishment in Chihuahua?

EZ Air Interior Ltd. is a joint venture between Zodiac Aerospace and Embraer. The company was established in June 2012 with the goal of consolidating all cabin interior parts production for the Embraer 170/190 family of jets. An agreement was signed with Zodiac Aerospace, Embraer’s original supplier, and the decision was made to manufacture the parts in a cost competitive country to drive competitiveness. EZ Air Interior Ltd. was established in Chihuahua, Mexico because Zodiac Aerospace and Embraer had already successfully established companies there.

What is the nationality of EZ Air Interior Ltd.?

EZ Air Interior Ltd. was founded and is registered in Ireland, but 50% of the company is Brazilian and 50% of the company is French. Most of our designs and corporate services come from the United States. Thus, the company is a unique blend of many different nationalities.

What are the differences between EZ Air Interior Ltd. and other OEMs and manufacturing companies in the Chihuahua aerospace cluster?

The integration of the company is our main differentiator. EZ Air Interior Ltd. has no corporate office, but rather has two parent companies, which are among the largest aerospace companies in the world. EZ Air Interior Ltd. tries to make its own decisions while still remaining in harmony with both Zodiac Aerospace and Embraer. The all-inclusive integration is that both the supplier and the client are the owners of the company.

What are the specific gaps in the supply chain?

There is still a significant amount of gaps in the local supply chain of Chihuahua, and development is still in its infancy with progression being very slow. Initiatives, like business-to-business encounters, have been put in place to help stimulate change, but to increase the growth rate there should be government policies that create investment incentives. Homegrown Mexican companies need assistance to be properly prepared for the level of demand from the aerospace industry. Some of our tooling parts have been developed in partnership with local suppliers. We provide training to our local suppliers by sending them to the United States to acquire knowledge and skills. Initiatives like the one in Zacatecas should be propagated in more companies with the participation of authorities and the interests of the national community.

What opportunities does EZ Air Interior Ltd. see for the near future?

Development will be quite difficult as the structure of the company is currently limited. We have aggressively grown since our establishment, and currently we are stabilizing our operations. The aim is to remain steady in our work and focus on optimizing productivity with regards to quality and the expectation of costs. We have a very aggressive training plan for our employees, sending them to work for our two parent companies in order to understand the process and philosophies for the new E2 project. By understanding those ideals, integration will be much more comfortable. The next few years are going to be a period of consolidation of philosophy and mindset. Embraer aims to deliver the first E2 aircraft in the beginning of 2018, of which all the interior parts will be manufactured by EZ Air Interior Ltd.

Do you have a final message for our international readership, those looking at Chihuahua as a potential aerospace destination?

The aerospace industry in Chihuahua has significant potential. There is an in-depth understanding of the business and what happens within the industry. Presently, there is the challenge of expanding bringing products and processes to the area. There is huge potential for success within the industry, which is evident by the growth of newly established companies. One can expect success if you establish operations in Chihuahua.
in 2011 with his business Altaser Aerospace. “The first machine we purchased—a brand new, continuous five-axis—was actually too aggressive of a move. Very few companies had high speed, high accuracy, and we realized very quickly that what we needed to build up our credibility before clients would be comfortable purchasing our five-axis products,” explained Avila. After proving their competence—first with two-axis turning, then three-axis turning with grinding, and now multi-axis vertical lays—business catalyzed, and within months Altaser needed to relocate to a larger facility. When Altaser be- gan, it was the only independent machine shop doing aerospace parts. “Today you can see many, and all others are foreign compa- nies. Mexican companies should not be discouraged from enter- ing this sector, because I can confidently say that the return on investment will be double initial expectations,” affirmed Avila. Altaser Aerospace has since developed a successful 50-50 partner- ship with Kilgour and received the backing of Grupo Punto Alto, an investment arm focusing on supporting and promoting 10 institutions that show promise of sustainable development. “The growth projections of the aerospace industry are significant and the industry will be growing for the next 20 years,” explained Al- berto Terrazas, director of Grupo Punto Alto, “and we decided to make use of [Altaser] as an opportunity to be involved.” Together with Kilgour, Altaser is expanding the availability of chemical processing to Chihuahua, and the pair also plans to cre- ate a more cost-effective engineering service so manufacturers can source the necessary machine programming that is required by the industry. On a grander scale, the Desarrollo Económico del Estado de Chi- huahua (DESEC) continues to work on enhancing the advanced manufacturing capabilities of small- and medium-sized enter- prises (SMEs) in Chihuahua, supported by the National Technological University (CONACYT). Dr. Juan Méndez Nonell, general director of DESEC, notes that the rationale behind placing this facility in Chihuahua was due to the strength of the local govern- ment’s support, it being a developing nucleus for the aerospace and automotive industries, and the absence of research centers and equipment in the northwest of Mexico. Equipped with three transmission electron microscopes and three scanning electron microscopes, this laboratory conducts chemical analysis, materials testing and magneto research critical for materials and composites develop- ment. “Altaser works with CIMA V (Advance Materials), which is one of CIVAM’s greatest successes was devarat Licenciate Avila, a long-term OEM in Chihuahua,” said Dr. Méndez. The company offers a software application that supports commercial aircraft harnesses for SAFRAN Linair, doubling their production and growth in the aerospace sector. “We work to provide blanking machining, and add value to aircraft—i.e. improving aluminum alloy nanopar- ticles via dispersion, enhancing its characteristics and resistance with a resultant weight reduction for the material. Other projects focus on electrical work for the manufacture of components for aircraft flight systems; modernization of polyurethane foam for aircraft cushions; and software design development sup- port for harnesses in commercial aircraft,” said Dr. Méndez. In accordance with industry demands to make materials lighter, stronger and more flame retardant, future research endeavors will integrate composites, polyimide, and lightweight metals. Through this collaborative approach, Altaser has evolved with the constant need to dedicate time to collect information, analysis, and review of test results, allowing Altaser to grow with the company trying to do business in aerospace, they were fixed at around $200,000. Altaser has included training work for the manufacturers’ clients, and 20 companies offered joint-venture proposals, and we were con- siderably higher than that which we did not have a chance of taking in our marketing. Given the high cost of the project, our marketing team worked with the vision of the local government to find a way to not only attract, but to motivate the investor to invest in the project. Altaser was granted a temporary waiver by HCMO—facilitated by the vision of Mr. Avila. The development company has already worked with many international companies, including Kaman, Zodiac Aerospace, and Fokker AEROSCOPES. FabLab hopes to expand its diversity of equipment in the near future, incorporating laser machines, CNC lathes, and 3-D printers in the near future, allowing SMEs cost-effective means of furthering design and development of their own products. In addition, FabLab is currently working in partnership with DESEC towards the creation of a configuration management service, an area in which we plan to create a more cost-effective option. Can you give a brief introduction to Altaser and how it has evolved since its creation? • While we were part of the Centro de Desarrollo de Proveedores de Chihuahua (CDEP), which was oriented towards getting local industries incorporated into the supply chain for large global compa- nies, many business opportunities were detected. There was a lot of struggle along this way, and we did not see success for an extensive period of time; however, after conducting a market analysis, we realized high precision machining was a gap that still needed to be filled. We decided to par- ticipate and started from scratch by con- tacting potential customers. In December of 2011, Altaser was legally established as a supplier in Chihuahua pursuing AERO- space work on machined parts. To ensure the success of Altaser, it was important to establish an established customer network. Altaser continues with local machining operations and fabricates high-quality parts. Modernization of equipment and a greater understanding of its capabilities will lead to a more cost-effective option. Can you give a brief introduction to Altaser and how it has evolved since its creation? • While we were part of the Centro de De- sarrollo de Proveedores de Chihuahua (CDEP), which was oriented towards getting local industries incorporated into the supply chain for large global compa- nies, many business opportunities were detected. There was a lot of struggle along this way, and we did not see success for an extensive period of time; however, after conducting a market analysis, we realized high precision machining was a gap that still needed to be filled. We decided to par- ticipate and started from scratch by con- tacting potential customers. In December of 2011, Altaser was legally established as a supplier in Chihuahua pursuing AERO- space work on machined parts. To ensure the success of Altaser, it was important to establish an established customer network. 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We decided to par- ticipate and started from scratch by con- the company—constantly obtaining the proper certifications—is assuaged through the help of the locally NADCAP-certified in- stitution, the Centro de Investigación en Materiales Avanzados (CIVAM). CIVAM is a public-research center devoted to ad- vanced materials and belongs to the National Council of Science and Technology (CONACYT). Dr. Juan Méndez Nonell, general di- rector of CIVAM, notes that the rationale behind placing this facility in Chihuahua was due to the strength of the local govern- ment’s support, it being a developing nucleus for the aerospace and automotive industries, and the absence of research centers and equipment in the northwest of Mexico. Equipped with three transmission electron microscopes and three scanning electron microscopes, this laboratory conducts chemical analysis, materials testing and magneto research critical for materials and composites develop- ment. “Altaser works with CIMA V (Advance Materials), which is one of CIVAM’s greatest successes was devarat Licenciate Avila, a long-term OEM in Chihuahua,” said Dr. Méndez. The company offers a software application that supports commercial aircraft harnesses for SAFRAN Linair, doubling their production and growth in the aerospace sector. “We work to provide blanking machining, and add value to aircraft—i.e. improving aluminum alloy nanopar- ticles via dispersion, enhancing its characteristics and resistance with a resultant weight reduction for the material. 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What percentage of FabLab’s business is devoted to the aerospace sector? Around 60% of FabLab’s business is aerospace-related, and this contribution has begun to show steady annual increase. As a manufacturing and product development company, FabLab has a strong commitment to protect the intellectual property of its customers, and we work with: Soisa Aerospace, where FabLab has been supporting design fabrication of tooling and sheet metal parts; Kama Aeronautics for space design fabrication of tooling; Zodiac Aerospace, providing threading inspection and dimension for detailed parts; Fokker Aeronet, including sheet metal parts details for shop aids and testing parts for wing assembly; and Althera Aerospace. FabLab also offers the facility of prototyping, i.e. design tooling and sheet metal parts. The company is expanding its business portfolio to new potential customers in small-part fabrication within the aerospace cluster, i.e. Embraer, Tightly and CAV Aerospace, Amptor, Chandler Industries, L3, Textron, Brevikraft, and others. FabLab has the expertise and machines to support the aerospace cluster in Chihuahua and Mexico.

Can you give a brief introduction to FabLab and its role in the aerospace sector of Chihuahua and Mexico? FabLab is a project funded mostly by PRO-CEI, which is a cooperation program between the European Union and Mexico under the management of ProMexico and sponsored by the Ministry of Economic Development of the Estado de Chihuahua (DESEC). FabLab seeks to increase the competitiveness and advancement of manufacturing in Chihuahua with emphasis on the metal-mechanic sector, transversal across the aerospace, automotive and electronics industries. Equipped with computer numerically controlled (CNC) machines, the latest technology in design, and equipment capable of manufacturing tools, we produce and launch parts for products in the manufacturing industry. This allows small and medium-sized enterprises (SMEs) to expand the local supply chain for transnational companies. FabLab is a great strategic support for the industry in Chihuahua.

What is CIMA V’s plans for expansion? As part of a five-year plan, FabLab is building additional facilities for the aerospace industry at its Chihuahua premises that are due to be completed by June or July 2016. These facilities will incorporate new equipment, including a scanning electron microscope to characterize materials to prepare samples for the transmission electron microscope and three scanning electron microscopes and two transmission electron microscopes and three scanning microscopes to conduct chemical analysis, materials testing, laboratory supported by top-line equipment, we conduct chemical analysis, materials testing, and magnetics research. What emerging trends do you see for advanced materials in aerospace? We continue to partake in valuable advancements in the performance of materials—i.e. improving aluminum alloy nanoparticles via compliant in June or July, where the increased resistance with a resultant weight loss for the material. Other projects have included: development work for the manufacturing of bushings for aircraft flight systems; modernization of polycrystalline foam for aircraft cushions; and software design development support for hardware manufacturers. CIMA V’s Chihuahua research facilities are state-of-the-art. They include three transmission electron microscopes and three scanning electron microscopes. Within the research laboratory supported by top-line equipment, we conduct chemical analysis, materials testing, and magnetics research. What is FabLab’s timeline for expanding its capabilities? For 2016/2017, FabLab would like to expand its technical capabilities by acquiring other types of equipment, including laser machines, CNC lathes, and 3D printers. This will fill the gap of our service offerings and enhance our core business, granting needed services to SMEs and aerospace companies. Do you have a final message for our international readership looking at Chihuahua as a potential aerospace destination? Chihuahua has a competitive market environment, supported by technical and engineering expertise, as well as equipment to fulfill the needs of the aerospace sector. Chihuahua has the latest technology, including laser machines, CNC equipment for machining processes, and the most advanced technology for metal parts fabrication. The region has the capabilities of becoming a worldwide hub for advanced materials and complements like Centro de Investigación en Materiales Avanzados (CIMA V) working jointly with CIMA V to support local SMEs to strengthen the supply chain and offer world-class engineering services. FabLab is thus currently working in partnership with DESEC towards the creation of ECC, a configuration management and design center for engineering services, to meet directly the needs of original equipment manufacturers in Chihuahua. The goal is to keep increasing the number of aerospace players in the country, which is done through collaboration and best realizing the market potential.

Director General
CENTRO DE INVESTIGACIÓN EN MATERIALES AVANZADOS (CIMA V)
Please provide a brief introduction to CIMA V and its role in Chihuahua’s and Mexico’s aerospace sector. CIMA V is a public research center belonging to the National Council of Science and Technology (CONACYT) that promotes the scientific, development and technological modernization of Mexico. CIMA V was founded in 1994; it is one of 27 research centers created in 1994; it is one of 27 research centers created in 1994; it is one of 27 research centers created in 1994; it is one of 27 research centers created in 1994; it is one of 27 research centers in the world. We continue to participate in valuable advancements in the performance of materials—i.e. improving aluminum alloy nanoparticles via compliant in June or July, where the increased resistance with a resultant weight loss for the material. Other projects have included: development work for the manufacturing of bushings for aircraft flight systems; modernization of polycrystalline foam for aircraft cushions; and software design development support for hardware manufacturers.

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Zodiac Aerospace, SOISA Aerospace and Universidad La Salle work together in designing aircraft seats

**Chihuahua** is testing our comfort levels, as the formerly maquiladora-centric aerospace hub embraces the realm of design. Zodiac Aerospace, in conjunction with SOISA Aerospace (SOISA) and Universidad La Salle Chihuahua (ULSA), is spurring innovation activity relative to airplane seats, developing new concepts that are already acquiring international recognition and awards. Zodiac Seats specializes in passenger seats for commercial aircrafts, including Boeing’s and Airbus’; and the Chihuahua plant contains a 130-persons design team dedicated to creating turbulence in the industry.

In regards to manufacturing, each airline customer wants a specific seat design. In Zodiac Seats Chihuahua, transforming raw materials into finished parts is according to the demands of its customers. Nearly half a million products are produced per month in this single plant dedicated to economy-class seats, all of which need to form a seat that is both spacious for the passenger and comfortable for the airlines that as many seats as possible can fit in the limited cabin space. Zodiac Seats Chihuahua’s latest design concept is the Posture Seat: “This seat moves in coordination with the passenger, as all of the parts in the back of the seat are mobile and adaptable to human motion and attitude. Not to mention it is very light,” explained Baptiste Valois, general manager of Zodiac Aerospace Equipo de Mexico.

With a focus on functional and aesthetic design, Valois attributes SOISA’s contribution has been in cushion and dress cover development. In 2008, SOISA Aerospace started doing intermediate products. We received orders, received all the materials, and simply began sewing. In 2010, SOISA Aerospace started doing business with another Zodiac division and made machine parts for approximately half a year. Despite its success, it did not fit into SOISA’s vision to be the preferred supplier of cabin interiors. We sold the company to another local entity, Altair, which successfully entered the aerospace market. Altair created a primary export market, and after World War II, SOISA even began exporting a great deal to Russia. In the 1980s, SOISA expanded significantly to house five manufacturing facilities to keep up with demand; however, the economy changed in the 1990s and early 2000s. Clothing manufacturing started shifting to China and prices dropped, causing SOISA to shutter its operations in 2004.

**Can you provide a brief introduction to SOISA and how the company has evolved since its establishment?**

SOISA’s long tradition started in 1949 as an entirely local, family-owned, blue jeans manufacturing company. The Mesta brothers’ father took the company through many changes over the following 50 years to 60 years. The United States has always been SOISA’s primary export market, and after World War II, SOISA even began exporting a great deal to Russia. In the 1980s, SOISA expanded significantly to house five manufacturing facilities to keep up with demand; however, the economy changed in the 1990s and early 2000s. Clothing manufacturing started shifting to China and prices dropped, causing SOISA to shutter its operations in 2004. In 2008, Jesus and Javier Mesta, the two founding brothers, along with five other people, decided to reopen in 2006 with an entirely different market: the aerospace sector. Altasia, a part of this spin off, SOISA created another company named HTMX for heat-treat processes as well, selling parts of the business that had emerged from our development to a local company to take over.

**What inspired SOISA Aerospace to expand beyond supplying?**

After drafting new business models based on the integration of new processes such as design, engineering, prototyping, research and development (R&D), certifications, and supply chain management along with the product manufacturing, SOISA became the first Mexican company to do so. Since then, SOISA has been integrating new processes such as design, engineering, prototyping, research and development (R&D), certifications, and supply chain management along with the product manufacturing, continually adding value to its customers.

**What was the direct impetus that led SOISA to focus on aerospace?**

SOISA needed a stable industry, outside of textile, and the automotive sector was in recession. In 2005, the Mexican government created policies to develop aerospace, and the entrepreneurial mindsets of the Mesta brothers lead them to focus on this sector. Already having to better test passengers’ overall experience in an aircraft cabin via an eight-hour flight simulation.

**How does SOISA Aerospace contribute to Chihuahua’s economic development?**

SOISA offers value-added employment. Our current payroll for 350 employees is almost equal to the payroll that we formerly had in blue jeans manufacturing for around 3000 people. As a part of this spin off, SOISA created another company named HTMX for heat-treat processes as well, selling parts of the business that had emerged from our development to a local company to take over.
Please provide a brief history of ULSA and its involvement in the aerospace industry.

NR: Universidad de La Salle began in the year 2000, in conjunction with the Chihuahua aerospace cluster. To assure we were responding to the industry’s needs, ULSA’s directors held a series of meetings with the private sector to align our courses with the present skills gaps. ULSA began offering programs focused on manufacturing parts and fuselages for turbines, and our curriculum continues to evolve as the industry is moving towards design.

In 2014, ULSA participated in Chihuahua’s Aerospace Integration Forum, and we continue to partake in all of the cluster’s organized events.

Approximately how many ULSA students choose a path in aerospace?

NR: Our relationship with the cluster has become so strong that 100% of our student body is attracted to working in aerospace. Students seem to be most interested in careers in design—working on seat redesign, parts, waste systems, etc. ULSA also offers programs in mechatronics, industrial processes, quality control, and electronics. JLF: Our students work in a variety of industrial functions. The integral aspect of ULSA’s interaction with the aerospace sector is that we can focus on hard sciences in relation to engineering, but we also have made significant advances in soft areas such as finance, commerce and human resources. ULSA is gradually increasing our scope of knowledge to make our students adaptable to the requests of the industry.

What relationships does ULSA have with companies to gain hands-on experience?

JLF: ULSA manages a wide network of connections. The most popular means of getting hands-on experience is through the internship program. In their final semester or shortly after graduating, students work on projects for an aerospace company supervised by an engineer. After six months, most students are offered jobs within their respective departments. Through our academic programs, students are granted the opportunity to develop independent study projects at the request of a local aerospace company. These assignments are supervised by the university, and typically coincide with a specific issue that a company is facing. Upon completion, students present their findings to the company’s management. Through our technology transfer and development programs, ULSA is particularly competent in designing materials and embedded parts that relate to a traveler’s experience in their seat as a result of our partnerships with Zodiac Aerospace and Soisa Aerospace. External career counseling with professionals is also readily available, granting our students access to the most realistic and up-to-date advice.

Do you have a concrete example of how companies are using our students?

JLF: Soisa Aerospace is a local success story that remains unfortunate for everyone. Soisa Aerospace, an entirely Mexican company, began as a gas and diesel engine repair shop in the 1960’s. With a current customer base of over 60 airlines around the world, Soisa Aerospace is a local success story that remains unfortunately uncommon. “The cycle of changing products for an aircraft is very long, leaving few opportunities for new suppliers to enter the market,” explained Valois. “A cabinet may be redesigned every five years, but the lifetime of an entire aircraft is typically twenty-five years... It takes dedication.”

Palomino High Precision Machining is another example of a local supplier successfully breaking into the aerospace market. What started as a gas and diesel engine repair shop in the 1960’s has evolved into a third generation family business, working on commercial and industrial CNC high precision machining for the aerospace industry. “The decision to increase our market from an automotive supplier to a multi-market supplier in the local manufacturing and aerospace industries did bring a great deal of challenges,” explained Luis Palominor, director of operations at Palominor. “One of the most significant being the culture this implied...there is no shortcut when it comes to entering the aerospace industry.”


What is the vision for ULSA and the Parque de Innovación for Chihuahua on a grander scale?

NR: The ULSA group consists of 15 universities around the country and has helped our Chihuahua campus to expand dramatically over the past 15 years. The Parque de Innovación, now in its third year, represents what we call a second motor of growth for our university. For the private sector, we stand for the only university seat in the state with the capacity to supply power to our facilities, neighboring companies and to a vast portion of the state. JLF: The Parque de Innovación has a focus on innovation as a tool for social change. The future of aerospace in Chihuahua will have a lot to do with industrial design, composite materials, embedded systems and software design. ULSA is currently working with the program to restructure our laboratories to create a shared focus in the realm of design.
What new innovations does Wesco Aircraft Chihuahua offer, and how does Wesco Air- craft best accommodate immense custom- er demand? As a supply chain solution provider, we are constantly looking for ways to add value to our customers’ businesses. We have taken advantage of our expanded facility space to implement chemical management services (CMS), allowing us to become a true, one-stop-shop for our customers in Mexico. The new temperature-controlled chemical stor- age area will be able to support the entire Chihuahua aerospace cluster. Once we have successfully implemented these features in Chihuahua, we are planning to do the same at our Querétaro facility. Our commitment to continuous improvement and applying best practices ensures that our customers experi- ence greater efficiencies as our relationship with them grows.

Does Wesco facilitate the process of im- porting raw materials? Wesco Aircraft uses its expertise in inven- tory management and logistics to manage the supply chain on behalf of its customers. We help control the supply of raw materials and give our clients the peace of mind that they need to focus on their core business, which is building aircraft. In Mexico, we are currently working under a shelter agreement that facilitates our import processes according to NAFTA regulations. In collaboration with other companies in the Chihuahua aerospace industry, we consolidate our shipments in El Paso, Texas, and share the cost of transporta- tion to Chihuahua, thereby reducing costs for our customers.

Can you provide a brief introduction to Wesco Aircraft and how the company has evolved since its establishment? Wesco Aircraft is one of the world’s largest distributors and providers of comprehensive supply chain management services to the global aerospace industry. We are a one-stop shop for hardware, chemicals, bearings, elec- tronic products, customer-designed products and tooling, and also provide value-added services like quality assurance, just-in-time delivery, point-of-use inventory manage- ment, and kitting countability.

In 2011, Wesco Aircraft established its first facility in Mexico, choosing Chihuahua as a prime location for its growing aerospace sector. In subsequent years, our business in Chihuahua has expanded to support a large scope of work for our major original equip- ment manufacturer customers in the area. We moved to a new 45,000-square-foot facility in 2015 to accommodate this growth.

Can you elaborate on the collaborative na- ture of Chihuahua’s aerospace cluster and how the industry operates? We have a unique, collective culture in Chihuahua. The local aerospace businesses, or the aerospace cluster as we like to call it, consider every company here as a key contributor to the image of this region. The value of shared success promotes a sense of unity and collaboration.

The aerospace cluster operates like a well- oiled machine, continually sharing ideas on how to fill gaps in the market and find sustain- able win-win scenarios that contribute to our mutual success. If there is a smaller company that needs support, the established companies do not hesitate to get involved and give the help needed. The collaborative mindset is im- dispensable to doing business here.

What gaps do you feel still exist in Chihuahua that need nurturing? There is a lot of room for the Chihuahua aerospace industry to learn and implement technologies that are new to the region, such as composite materials and avionics. These technologies are already in place elsewhere and there is an increasing market for them in the Mexican maintenance, repair and over- haul sector. Developing interest and getting people involved in the training and certifica- tion process is essential.

What technologies have improved supply chain management and helped mitigate is- sues? Significant advances have been made in real-time connectivity. Real-time data and inven- tory analysis tools are used to react quickly to any changes in the supply chain and to ensure optimal stock is in place to support our customers. This advanced connectivity helps us to verify the inventory that we have on hand, determine the stock gaps that we need to fill, and forecast customer needs based on closely monitored usage information.

What goals does Wesco have for the next five years in Mexico? In 2014 we acquired a house group in international, a premier chemical management services provider, we have a great opportu- nity to support chemical product and service needs. We are already an established service provider to the Mexican automotive industry, with over 300 employees supporting vari- ous customers on site. We will be working to grow our CMS business in Mexico with the broader aerospace market.

We are also increasing our support to the Mexican aerospace industry by opening our first sales office in Chihuahua, taking care of many local accounts that previously were managed by our corporate office in United States.

Do you have a final message for our in- ternational readership, those looking at Chihuahua as a potential aerospace desti- nation? Internationally, not many people know how much has been and is being accomplished here in the Mexican aerospace industry. We have proven that we are capable of handling significant levels of responsibility, and we will only continue to grow. *
which 6.1 million sq. ft. is leased. In the Mexicali. The company is continually looking for Intermex’s shelter customers to receive our logistical service offerings, which includes different aspects of the manufacturing process, which we can handle both efficiently and affordably for our customers. There are custom regulations that apply specifically to the aerospace sector in Mexico, and Intermex fully understands and utilizes these regulations. Freighting also carries distinct regulations, as many manufacturing companies must comply with them for their operations.

The Impending MRO Project

Adjacent to Chihuahua’s international airport, the state government has acquired more than 200 hectares of land to develop a new industrial park to service additional aerospace processes. “This new industrial park will offer services to the whole aviation maintenance market in the north of the United States,” expounded David Dajala, delegate for the Secretary of Government. The government has been coordinating with Boeing, Embraer, Airbus, etc. to understand what is needed for Mexico to have a final assembly plant, and its research has focused efforts on developing the needed infrastructure and research and development (R&D) technology park and cheap, reliable energy. At the beginning of 2016, a new combined-cycle gas turbine is being installed near the airport to complement the gas pipelines coming from the United States. “With cheap gas, cheap power, high-quality workers, and the best customs processes in the country, Chihuahua is primed to welcome new business to the region,” said Dajala.

The timeline of the project rests on the variability of an MRO presence and, with that, strategic suppliers, an assembly plant, and a demolition and recycling center should follow. Plans are already in motion to construct airplane parking and parking centers at the airport, which are expected to be completed by the end of 2016.
Vision of growth, there are three main elements that all global operations are striving towards. Firstly, Fokker wants to be close to our customers. Secondly, we need to be global, but mostly, we need to innovate and serve our customers with the latest technologies.

Chihuahua was also chosen due to its rich aerospace and automotive history. I started the first aerospace company here in 1985, which was a subsidiary of Westinghouse that eventually transitioned to SAFRAN. The great foundation from the automotive industry facilitated a swift adjustment into aerospace, as many car parts and the first car airbags were actually manufactured in Chihuahua in 1980. A great deal of know-how can be transferred from high-volume techniques and industry expansion planning from that sector. Presently, Chihuahua has four original equipment manufacturer (OEMs) and 31 tiers working together as a cluster, one of the only clusters that has clear steps for evolution over the next 20 years. Chihuahua has a vision to build a complete aircraft within its borders by 2024.

What is the breakdown of Fokker’s Chihuahua facility in terms of capabilities, staff, and machines?

Beginning from a greenfield, what stands today is merely the first of four phases that are expected to be completed by 2020. Our facility is 80,000 square feet (sq. ft.) but will expand to 360,000 sq. ft. in 2015. This is now Textron Aviation, was our first customer in March 2012. Fokker Chihuahua constructed the encampment of Cesuna’s Citation business jets, and our latest awarded projects include contracts with Gulfstream and HondaJet.

The new Hondaliner aircraft is now certified for flying as of the last week of 2015. Right now, we are assembling aerospace structures with the use of compressors, painting, finishing, polishing, the application of sealants and chemicals, and more. We are very integrated as all processes are done in-house. Fokker Chihuahua started with the two main certifications that drive quality, the IS9000 and the AS 9120, and we continually obtain new certification to uphold regulatory requirements of our customers.

Moreover, we have immediate corrective action systems and highly experienced human capital. We train our staff over an intensive three-month period, and our plant has one of the lowest turnover rates in the area.

Can you elaborate on Fokker’s participation in the development of the local supply chain?

To do so, we have a more solidified presence, we are seizing the opportunity to purchase supplies at a closer range. Developing the supply chain is one of Fokker Chihuahua’s key factors for measuring success. Currently, we are buying more than 35% of our parts from Mexico, a number that we hope to increase worldwide. Fokker maintains partnerships with local companies, such as TIGHITCO for aluminum, and are actively helping to develop Altasor, a small-components and complex-tooling company that originated in Mexico. Universities, such as the Techno Monterrey, are working to establish small businesses from which Chihuahua’s aerospace industry can both grow and benefit. We are working closely with our Fokker’s supply chain development team in Atlanta to improve the selection and development of suppliers in Mexico, through partnerships if needed, to consolidate the aerospace supply system. It is a gradual process, but we are determined to assure that the aerospace industry is stimulating local businesses.

Chihuahua’s aerospace industry has developed and strengthened very quickly. Now, that we want to attribute its success to:

- Chihuahua has its own version of the three national development phases: an industry diagnosis, a roadmap with points on a best direction to move, and a strategy how we can best promote ourselves as an attractive destination for international investment. Chihuahua’s public-private alliances are the key to its success, particularly with the schools. Technology students keep a live feed of the progress that is happening here, and we showcase all of the components Chihuahua is capable of creating at their facilities to point our future technicians and engineers excited about where this industry is going. Chihuahua is strong in terms of aerospace and automotive industries, but it is worth noting that a majority of the local aircraft parts are manufactured here.

Why was Chihuahua specifically chosen as a facility site?

VP: Chihuahua was chosen from the desire to be in close proximity to original equipment manufacturer (OEM) customers and the ability to provide low-cost, sheet metal fabrication here. •

Héctor San Martín Benavides & Víctor Prieto Cano

Why is TIGHITCO planning to introduce its sheet metal products to other states in Mexico?

VP: Chihuahua is developing into a hub for sheet metal processing and finishing; and is TIGHITCO planning to introduce its sheet metal products to other states in Mexico?

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TIGHITCO AEROSTRUCTURES CHIHUAHUA

HSM: TIGHITCO is leading the field in sheet metal fabrication for aerospace in Chihuahua and was the first to establish this type of service offering in the region.

Can you explain to what extent sheet metal fabrication takes place in the Chihuahua facility?

VP: TIGHITCO’s Chihuahua facility has a generic necessity for sheet metal cutting processes for three-axis and four-axis, computer-numerical-control routing, manual tools for deburring, brake presses, and a hydraulic forming machine. There are also special processes including: in-house chemical film and chromic acid anodizing with different recipes, heat treatment, painting incorporating applications of primer and corrosion preventative paint plus masking, and applications for cosmetic visual cockpit parts. Operators and inspectors follow a fully documented quality system for all applications.

To what extent does TIGHITCO invest in training and human capital development?

VP: In 2009, TIGHITCO was limited specialized training facilities in local schools, but a subsequent training initiative from the Mexican government assisted TIGHITCO in developing an in-house training system for its specific operations. The company is always looking to develop and promote its personnel from within via the company’s robust training system for its engineering/aerospace sector.

HSM: TIGHITCO is able to draw from engineering/aerospace students with the required knowledge from the local university or technical schools. Those pre-existing skills are then enhanced by TIGHITCO’s in-house training to elevate the students to the required level of expertise. The government’s training initiatives significantly helped fill the skills gap.

What evolutions have you seen within Chihuahua’s aerospace sector?

HSM: The whole aerospace sector in Chihuahua is developing, and competition is increasing in sheet metal, harnesses, and special processes. TIGHITCO is looking to further develop its service offering in Chihuahua for example, non-aluminum materials, i.e. steel titanium, whilst maintaining its core products, i.e. sheet metal.

Is Chihuahua developing into a hub for sheet metal processing and finishing; and is TIGHITCO planning to introduce its sheet metal products to other states in Mexico?

INTERVIEW

Global Business Reports

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MEXICO AEROSPACE 2016

Industry Explorations

Industry Explorations

MEXICO AEROSPACE 2016
Can you give a brief introduction to L3 Aerospace and how the company has evolved since its establishment in Chihuahua?

L3 wanted to establish manufacturing operations in a lower-cost region as a means to enhance its profitability. Consider- ing we already had a customer in the region, Chihuahua was an ideal location, and the city is particularly focused on aerospace when compared to other Mexican regions. Another motivation was that sheet metal operations require special sheet metal processes, and these processes are already provided by the Metal Finishing Co., and L3 was able to open its facility in the same building.

Can you elaborate on the equipment and processes within the L3 facility?

L3’s facility in Chihuahua is 60,000 sq. ft. equipped with new Haas CNC machines. Using well-known brands helps us to se- cure business from the original equipment manufacturers (OEMs), as well as more onsite support for machine mainte- nance. We currently have three-axis CNC machines, a CNC gantry machine with a long bed for large parts; router machines for sheet metal; a water jet for cutting very hard materials; a forming cell, which is the machinery used to give form to aluminum sheets; as well as three hydroforming ma- chines, one of which is long bed. L3 has the unique capability to work with long pieces of different types of metals, which is often a limiting factor for compa- nies of our craft. Another unique capability that we can offer to the industry is stretching and forming processes for aluminum extrusions. Currently L3 is the only facili- ty with stretching-capabilities in Chihuahua. With all of our equipment, we are able to produce machining parts, aluminum-sheet metal parts, and formed parts for any type of aircraft.

Where does L3 source its supplies, and what is your assessment of the local supply chain?

Concepts for operations are based on alu- minum and sheet metal, we have a small number of suppliers. All supplies are cur- rently imported from the United States. It will be beneficial for L3 to have a supplier base in Chihuahua, as it would decrease lead times and costs. We need local suppliers that can conglom- erate the supply and demand of several companies so that the inventory invest- ment makes sense. It is easy for a maquila to obtain an Immex permit, but there are many tax benefit returns. The gap in the local supply chain offers many oppor- tunities for investors.

Where does L3 source its employees, and what is the size of the current operational staff?

L3’s capabilities are based on sheet metal, but we are not limited. We intend to work on composite materials and plastics, as these capabilities reside in our parent company. The initial idea was to establish a company that would grow continuously. L3 comes from the same school of thought and we know that sustainable growth is necessary for a company to achieve sustainable growth, we operate as an independent company from our opera- tional branch. The main difference is that we are a profit center and not a cost center. Our sheet metal cutting and forming capa- cities will continue growing for the en- tire year of 2016 and beyond. We are already in conversation with potential customers that require other techniques and tech- nologies, forcing us to update our opera- tions and offerings according to the latest demands of the industry. The timeline to start our new operations was one year, giving L3 the projected start date of 2017. The diversification of knowledge and having a team with forward thinking and a vision is extremely motivating.

What is L3’s role in the further develop- ment of the aerospace in Chihuahua?

The vision is to offer the aerospace mar- ket critical parts at a competitive cost, all while ensuring the highest quality and on-time delivery. The expertise of Crest- view Aerospace, which is our parent plant, is very extensive, and their technical sup- port can help L3 make a different process in industry with regards to new processes and products in the Chihuahua region. L3’s capabilities are based on sheet metal, but we are not limited. We intend to work on composite materials and plastics, as these capabilities reside in our parent company. The initial idea was to establish a company that would grow continuously. L3 comes from the same school of thought and we know that sustainable growth is necessary for a company to achieve sustainable growth, we operate as an independent company from our opera- tional branch. The main difference is that we are a profit center and not a cost center. Our sheet metal cutting and forming capa- cities will continue growing for the en- tire year of 2016 and beyond. We are already in conversation with potential customers that require other techniques and tech- nologies, forcing us to update our opera- tions and offerings according to the latest demands of the industry. The timeline to start our new operations was one year, giving L3 the projected start date of 2017. The diversification of knowledge and having a team with forward thinking and a vision is extremely motivating.

What was the incentive for MFCO to estab- lish a facility in Chihuahua?

Beeschert made a significant portion of its operations to Chihuahua and focused on assembly. Though it produced most of its strength internally, it decided to outsource chemical processing operations, creating a demand for contract metal finishing services. Our main goal was to become certified within two years for all OEMs operating in Chihuahua. Currently we are approved by Cessna, Boeing, Bombardier, UTAS, Bell Helicopter and recently Honda Jet. MFCO was able to develop a commercial processing contract and strategic partnership with Bombardier. We can currently work on future approvals for products that Bombard- dier is aiming to bring to Mexico. Most of their aeronautics are imported, but approx- imately 85% of the few that they buy in Mexico come from Chihuahua.

What differentiates MFCO in the mar- ket?

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How long will MFCO maintain its anodizing, chemical conversion, NDT, and chemical treatment capabilities?

MFCO is currently developing other NDT techniques with its customers. The aim is to transfer the entire service scope of MFCO to the Chihuahua facility, but this will follow the industry trends. Six months ago MFCO decided to add aluminum heat treat- ment that will be ready for operation soon. MFCO is currently developing other NDT techniques with its customers. The aim is to transfer the entire service scope of MFCO to the Chihuahua facility, but this will follow the industry trends. Six months ago MFCO decided to add aluminum heat treat- ment that will be ready for operation soon. MFCO is currently developing other NDT techniques with its customers. The aim is to transfer the entire service scope of MFCO to the Chihuahua facility, but this will follow the industry trends. Six months ago MFCO decided to add aluminum heat treat- ment that will be ready for operation soon.

What on-time and quality-control mea- sures does MFCO employ to ensure it can turn around orders within three to five days; of course, turn times depend on the quantity or complexity of the parts. All orders are time-sensitive, and we focus on being efficient while still delivering the best quality possible. The company has no human per- sonalization and mutual customer-business under- standing we were able to close 2015 with 98% on-time delivery. According to the CEO, we will be able to make that process occur on time. All orders are inspected, counted, photo identi- fied, and loaded onto the system before they are shipped.

Can you describe the array of processes that MFCO Chihuahua provides? What new offerings have recently been implemented or are impending by MFCO?

Currently MFCO ships an average of 3,500 pieces a day, which only accounts for about 70% utilization of its current capacity, but potentially increases to 85%.

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As Chihuahua’s aerospace cluster expands, the need for an equipped workforce will grow accordingly. Over time, students contribute to the local labor pool, six of which offer aerospace specific degrees. The challenge is not the availability of people in itself, but rather, managing expectations as to what type of jobs will exist upon graduation. Fundación CIDAC, in collaboration with the United States Agency for International Development (USAID), published a study in 2014 on determining what parts and components there are still numerous gaps in the supply chain. Specifically, a potential business venture to fill specific gaps in the market?

What case studies can you highlight as a successful relationship between the Parque Tecnológico and an aerospace company?

The company and government all came together to develop a vision for the city of Chihuahua. We selected the aerospace, automotive and mechatronics industries as key focal sectors since Chihuahua has 50 years’ experience in the automotive industry and about 15 years’ experience in aerospace. Over the years the government has made significant efforts to invest and bring aerospace companies to Chihuahua, a major reason why the industry has seen significant growth. The Parque Tecnológico was the needed infrastructure to help develop people and connect companies related to software, automation and electronics to the aerospace and automotive industries.

The Parque Tecnológico is aerospace- and automotive-focused and is mainly lead by design, testing and engineering. Through collaboration with the corresponding clusters, we link our students and professors with projects in the aerospace industry. For example, Honeywell will assign challenges related to a part or component and the students will then work on solutions within a given deadline. These projects help mature the capabilities of the next generation of aerospace engineers. We have no goal to enter into the manufacturing sector at this stage, as the aim is to develop people.

An intention of the Parque Tecnológico is to develop an entrepreneurial spirit and attitude within its students. The goal is to have students create their own businesses as local suppliers for the aerospace industry—currently, 92% of aerospace industry suppliers are not local. Solving that problem starts with creating awareness and building opportunity.

The Parque Tecnológico funded and what is the business model behind the way in which it operates?

To build the infrastructure, the park received funding from Monterrey Tech, the private sector, and the federal, state and municipal governments. To secure the funding, the key factor was the ability, we have small- and medium-sized companies in the park that pay a monthly fee for space and access to the school’s resources. These companies, as well as opportunities for masters level programs in the future, but the reality of the industry’s demands still remain—quadrilla-centric. The excitement is surely present, but currently the large question lies in endurance and follow-through. “This industry needs to walk before it can run,” posits Salomon.

What are the top priorities for increasing capabilities?

Aerospace companies are just now starting to invest and bring aerospace companies to Chihuahua. The difficulty lies in endurance and follow-through. “This industry needs to walk before it can run,” posits Salomon.

What are some examples of the kind of projects the Parque Tecnológico has been involved in?

The Parque Tecnológico has been involved in R&D for new technologies, and we try to utilize them in current projects—for example the project related to the design of aircraft seats.

What is the vision for the Parque Tecnológico in the coming two to five years?

Aerospace clusters are precisely focused on investing in human capital and making a substantial effort to reach goals in design development.

What technological advancements coincide with the increasing demand and technological progress in the aerospace industry?

As the director for the R&D extension of the Parque Tecnológico, can you elaborate on what developments are currently in progress and what can be expected?

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Can you give an overview of the university and tell us a bit about the history of UTCH's involvement in Aerospace? 

**FRR:** The Universidad Tecnológica de Chihuahua (UTCH) is approaching its 15th year. We have been growing sustainably throughout its short history, constructing a new building each year, and our campus now consists of 18 rooms. The coming five years? Out of 129 technological universities in Mexico, UTCH was awarded the center's title. In August, we will inaugurate the official facility to Chihuahua as everything was already in, that field. Cenaltec's course comes at a perfect time, some of our instructors went to the Mexican President Enrique Peña Nieto and his French counterpart, François Hollande, to establish this program to be prepared to fill job openings. UTCH currently has 1,254 collaboration agreements between itself and companies in the production sector. These agreements range across industries; from aerospace, automotive, metallurgy, etc. We provide qualified laborers, which contribute to UTCH's level of prestige both in and out of our state borders. UTCH allows students to take part in exchanges or scholarship programs abroad sponsored by the government, and when our students return, they transmit a new mentality to their peers. It transforms attitudes towards navigating their career with a strong sense of security. Chihuahua is changing day by day and is becoming a better place to realize transformational careers.

What changes have you had to make to adapt to the trends in technology innovation or software development? 

**BPP:** UTCH is constantly updating its laboratories. Our Center of Innovation and Design for the Aeronautical and Astronautic (CIIDA) is a result of the commitment between the Mexican President Enrique Peña Nieto and his French counterpart, François Hollande, to establish this program to be prepared to fill job openings. UTCH currently has 1,254 collaboration agreements between ourselves and companies in the production sector. These agreements range across industries; from aerospace, automotive, metallurgy, etc. We provide qualified laborers, which contribute to UTCH's level of prestige both in and out of our state borders. UTCH allows students to take part in exchanges or scholarship programs abroad sponsored by the government, and when our students return, they transmit a new mentality to their peers. It transforms attitudes towards navigating their career with a strong sense of security. Chihuahua is changing day by day and is becoming a better place to realize transformational careers.

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What do you have any specific example of how UTCH has changed its curriculum to adapt to the necessities of the aerospace industry? 

**FRR:** We graduate a strong presence in every company based in Chihuahua. In the aeronautical industry, 67% of the instructors and design group in Labinal, a company from the SAFRAN Group, are UTCH graduates. In aerospace, the need for a new product lifecycle management is a result of the Board's decision to develop the first class-room building being finished. UTCH needs to take advantage of the 30 hours in space we have to grow, because we predict that in 5 years our enrollment and faculty will have doubled. UTCH is also about to announce the launch of two master's programs, and eventually we hope to establish a doctoral program.

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Having been established in 2008, please provide a brief introduction to UPCh and the university’s involvement in the aerospace industry?

La Universidad Politécnica de Chihuahua is an institution of higher education belonging to the system of polytechnic universities of Mexico. There are about 58 universities with recognized for the quality of our educational programs and our educational model is based on teaching skills and being social and technical competitiveness, where students have access to on campus.

What has CAAMEX started to provide training, consulting, and design of educational manuals according to the needs of the private sector. This guarantees that students’ knowledge areas are not out of touch with what the aerospace industry needs presently, in both the short and long term. Current objectives are engineers who work in design and production, while 50 to 60 are educators. The remaining numbers are college students who seek to be specialized in something particular to a job in the aerospace industry.

Where does CAAMEX source its aerospace engineering professors and computer-assisted manufacturing (CAM) software for aerospace, which is FAA- and DGAC-approved.

The CAAMEX cluster is already addressing the project needs of the Chihuahua Aerospace Cluster. As demands surface, the respective university level. Over time, training was offered in the following areas: manufacturing, automation, science and technology, and administration management of small- and medium-sized businesses. Our students spend three and half years obtaining their degrees, including at least 800 hours of working in their respective industry.

What relationships do you have with the different companies in the area to achieve these necessary hours?

UPCh has a strong link with industry. For example, one of our students studied aeronautical engineering and completed an internship with Cessa, focusing on composite materials. Companies specifically ask for UPCh students because we meld quality technical training into competency-based training. Classes such as Science of Materials properly teach students how to form composites, the engineering of the structures, the angles of formation, the chemicals and safety behind the processes etc., giving them a solid foundation for practical work in aerospace plants. The theory and instruction that they learn in the classroom is directly applicable to their work in the private sector. Not only do they learn the necessary hard skills, but UPCh teaches the humanistic side of engineering as well.

How many students graduate from UPCh’s aerospace programs each year?

This year we will have 98 graduates, and that number is always increasing. As the aerospace industry continues to grow in Chihuahua, more students are taking interest.

How does the UPCh curriculum properly prepare students to fill the vacant roles in the aerospace industry? And what kinds of industry related machines/software do students have access to on campus?

We are constantly in conversation with the Chihuahua aerospace cluster, the Chamber of Commerce, and other relevant institutions, listening to the direct needs of the industry and responding accordingly. For example, Rómulo Cevallos was in need of computer numerical control (CNC) operators, metrology and machine processing specialists. UPCh has courses that directly teach those skills. Our students also participated in one of NASA’s student projects and STEM students can apply their technical knowledge in real projects. The simulator allows students to respond accordingly. For example, Hon Flores specializes in maintenance, reparation, and inspection of aircrafts in several manufacturing plants in the area. Students have the privilege of working with tangible materials, actual fuse-lages, and with real power plants rather than simulated, as it presents real-life defects that would be difficult to experience without jeopardizing equipment. The simulator allows students to develop their field-specific skills.

Can you give a brief introduction to CAAMEX and how the institution has evolved since its establishment?

CAAMEX was officially established in 2012 as a training and consulting firm, but its beginnings trace back to 2004 when its founding partners started servicing businesses that repair and manufacture parts for aerospace plants. The theory and instruction that they learn in the classroom is directly applicable to their work in the private sector. Not only do they learn the necessary hard skills, but UPCh teaches the humanistic side of engineering as well.

In what ways does CAAMEX hope to advance over the next five years?

CAAMEX has active agreements that link with many educational institutions, which allows its students to receive the training they need, but at the same time adhering to the needs of the private sector. This guarantees that students’ knowledge areas are not out of touch with what the aerospace industry needs presently, in both the short and long term. Current objectives are engineers who work in design and production, while 50 to 60 are educators. The remaining numbers are college students who seek to be specialized in something particular to a job in the aerospace industry.

What are the students’ academic track options and how many students graduate each year?

The options vary greatly and courses are offered in the following areas: manufacturing, structural repair, sheet metal, structural analysis, non-destructive tests, metrology, machining, maintenance, aircraft power plant overhaul, applied aerodynamics, hydrau- dric, pneumatic, and electric systems. On average around 200 students graduate per year from our certification programs and workshops. Between 60 and 80 gradu- ates are engineers who work in design and production, while 50 to 60 are educators. The remaining numbers are students who seek to be specialized in something particular to a job in the aerospace industry.

How would you rate Chihuahua’s educational capabilities in comparison to other aerospace hubs in Mexico?

Previous factors ignited rapid growth in the aerospace industry. These factors have been in constant development over the years, which has made Chihuahua the perfect place for any stage of a project—from the design stage of an aircraft to its overhaul and maintenance—to attain success. Presently, Chi- huahua is named the aerospace center of Mexico. As a result, we have high standards for high-paced training. In regards to tech- nical capacity, I consider Chihuahua to be at a high level, especially when one takes into account the amount of experience that has been attained in recent years. This be- ing said, we are still growing regard- ing the level of education.

One practice that we focus on making sure those who graduate from current aerospace programs are prepared to immediately enter the aerospace workforce following gradua- tion. This is why theoretical and technical training is given. The aerospace industry requires hands-on knowledge.

With aerospace as a rapidly expanding industry in Chihuahua, do you predict an uptick in the number of students pursuing that field?

Absolutely. This trend can even be found seeping into this area’s high schools, which have begun to develop more training pro- grams to adhere to these needs. Technical certificates, bachelor’s degrees, and engi- neering programs all already exist in with a focus on aerospace.

In what ways does CAAMEX hope to advance over the next five years?

CAAMEX is already addressing the projected needs of the Chihuahua Aerospace Cluster. As demands surface, the respective university level. Over time, training was offered in the following areas: manufacturing, automation, science and technology, and administration management of small- and medium-sized businesses. Our students spend three and half years obtaining their degrees, including at least 800 hours of working in their respective industry.
Nuevo Leon has a very strong and developed industry compared to other regions, especially in metal mechanics. In contrast to the other aerospace clusters in Mexico, the aerospace industry in Nuevo Leon started with tier-one and tier-two suppliers.

“Nuevo Leon has a very strong and developed industry compared to other regions, especially in metal mechanics. In contrast to the other aerospace clusters in Mexico, the aerospace industry in Nuevo Leon started with tier-one and tier-two suppliers.”

- Pauline Medori, Managing Director, Monterrey Aerocluster
AN INTRODUCTION TO MONTERREY’S AEROSPACE INDUSTRY

Monterrey, located in the northern state of Nuevo León, is Mexico’s third largest metropolitan area. The region has enjoyed considerable economic growth over the years and today is the country’s second richest city. The main industries contributing to Monterrey’s economy are the steel, cement, glass and automotive industries in which many of the major players operating are Mexican owned companies. These sectors continue to be the main drivers for growth in Monterrey. This is the primary reason that the region has not seen as much of a focus on the aerospace sector. However, many companies are recognizing the growing importance of this industry, as are the government. “The aerospace industry is a strategic sector for the government of Nuevo Leon and we have been focusing substantially on getting aerospace companies into the state,” said Fernando Turner, the Secretary of Economic Development for Nuevo León (SEDEC). Companies looking to expand to Mexico see Monterrey as being able to offer an established business infrastructure and can also benefit from the city’s proximity to the U.S. border and its international airport. With its rich history in metal mechanic processes and the city’s growing aerospace sector through cementing the link between the triple helix that is government, industry and academia. The state government has representation in the cluster through SEDEC and the cluster acts as a guide for the government as to the policies to be taken for the development of the aerospace sector. The cluster is also implemental in educating the sector. To date, the Monterrey Aerocluster has imparted 7,402 hours of training, supporting 68 companies. In 2014, the aerocluster was awarded the Bronze Certification for cluster management by the European Secretary of Cluster Excellence. According to the cluster as of 2015, Monterrey’s aerospace sector directly supported more than 3,000 jobs and last year saw sales over $800 million. The expectation for 2016 is a growth of 13%.

Nuevo Leon’s main success story in the aerospace industry is Frisa Forjados. Originally a manufacturer of heavy capital goods for industries such as oil and gas and power generation, it is now one of the top three international providers of seamless rolled rings to the aerospace industry. Frisa is a good example of a well-established Mexican company diversifying to apply its expertise in the aerospace industry. “It is easier to transition from industries which are more technical and where the focus is more on the product rather that productivity,” said Frisa’s CEO Eduardo Garza T. Junco. “In any case, the barrier to entry for the aerospace industry will always be very high. It requires a long-term strategy in order to establish the trust that is so essential to being a supplier in this sector;” he continued. It is important to note that, unlike Mexico’s other aerospace hubs, the majority of Monterrey Aerocluster’s members are Mexican owned companies. In fact, 80% of companies with operations in the aerospace industry are local businesses. One exception is Monterrey Aerospace, the sister company to MD Helicopters and a defense oriented OEM. Despite being the country’s smallest aerospace hub in terms of number of companies, Monterrey is an example to Mexico’s other clusters as to how local companies can successfully diversify their activities into the aerospace industry. Today there are around 26 tier one and tier two suppliers operating in the Monterrey region mostly focused on metal mechanic work. Companies that have diversified into the aerospace industry have focused on fields that bear resemblance to their traditional sectors thus lending Monterrey a specialization in high-precision machining. Benito Gritzewsky, general director of, HEMAQ, a company that provides integrated solutions for CNC Machine tools, said, “Monterrey’s rich history in metal mechanic processes gave us the advantage of understanding what was needed from this sector.” Katcon garnered great success in the automotive industry manufacturing catalytic converters. The company is now applying its expertise in the design of components to create nonstructural composite parts for aircraft. Blanca Lopez of Maquinados Indus-
Nurturing talent – The importance of local academia

Tecnológico de Monterrey is one of the largest and most established private universities in Mexico and has 31 campuses in 25 cities across the country. The institution has been instrumental in the development of industries such as aerospace, automotive, and manufacturing. The university aims to train students who can meet the high standards of the aerospace industry.

The quality requirements of these industries are similar to that of the aerospace sector.

Metal mechanics demands secondary processes. Like in Querétaro and Chihuahua, in Monterrey there are still gaps in the secondary processes chain that need to be filled. But again, the major challenge is lack of demand due to the low volume nature of the aerospace industry. "Chemical processing is a huge challenge. The difficulty is that there is not enough work to make it beneficial for companies to establish themselves in the Monterrey region," said Medori.

The arrival of Noranco, a machining and fabrication company headquartered in Canada, may alleviate some of these challenges. Noranco's business model is to be as vertically integrated as possible with all secondary processes under one roof. Local companies will soon be able to benefit from the newcomer's internal capabilities such as special processing and heat treatment.

Certification certainly remains a challenge for SMEs wanting to break into the aerospace supply chain, but the Monterrey State Government has established a number of successful programs that allow companies to become certified in six months. The cluster also has an agreement with TVU whereby local suppliers want to expand into aerospace pay only 30% of the cost of a audit. Despite this support, accessing finances remains a challenge for smaller companies. With regards to developing the supply chain, the focus is on the Aerocluster as a way to develop local suppliers rather than attract international ones. However, attracting a prime contractor is a major imperative for Monterrey. "A large prime contractor will definitely encourage major developments in the aerospace sector which will lead to significant growth," said Secretary Turner.

It is important for the government to really understand the nature of the strengths of Monterrey's aerospace industry in order to identify which companies stand to gain most value from the region and vice versa. Continued efforts must be made by the government and the industry, through the Aerocluster, to promote the State's many competitive advantages abroad.

What is the importance of the aerospace industry for Nuevo Leon?

The aerospace industry presents a bigger challenge than some of the other industries, but for private investors, it is a long-term investment in terms of productivity, growth potential and competitiveness. Nuevo Leon is the fifth largest state with regards to the aerospace industry and the third largest state with regards to research and development. These ranks can be controversial, but the Monterrey site director for Noranco, this is the most valuable aspect of working together to address. For Aldo Rodriguez, the Monterrey Aerocluster has identified is the lack of skilled labor. Universities like Tec de Monterrey have identified this issue and offer technical education programs for the aerospace industry in Monterrey. This is a key issue that the cluster members are working together to address. For Aldo Rodriguez, the Monterrey Aerocluster is more than just a technical aspect of the aerospace industry. "As a cluster we can pool knowledge and work towards establishing communal training programs," said Rodriguez.

Shared training resources will allow companies to save money by cutting the costs of internal training. In this regard, the Aerocluster must work to promote the technical level of the younger generation, the majority of which today only have eyes for becoming an engineer. In 2006, the Autonomous University of Nuevo León (UANL) noticed how foreign investment was growing in the country’s aerospace sector, and in 2007, UANL started offering an aeronautical engineering program and began to look at the idea of having an aerospace-dedicated research center that would develop highly skilled human capital. The Center for Research and Innovation in Aerospace (CIHIA) was founded in 2012. "CIHIA offers bachelor’s degrees, where we train aeronautical engineers with a strong foundation in mechanical engineering, such like nickel and titanium based super alloys and composite materials," said Dr. Patricia Zambrano, general director of the center. CIHIA's focus on design is important for Monterrey's role in Mexico's aerospace. According to SEDEC, though the region is 5th in the country in terms of size, it is third in terms of research and technology. "Monterrey especially is home to some of the best universities and local design and engineering companies that have been able to benefit hugely form the wealth of talent," said Octavio Rangel, general manager of Demaq Technologies, a local automation company.

Demaq Technologies want to expand into the aerospace industry by offering automation solutions with a focus on testing and inspections. Strong capabilities in design and engineering coupled with the Mexico’s highest labor rate means that for foreign companies looking to invest in Monterrey should see the destination for higher value added and more technical processes.

What role is SEDEC playing in developing local SMEs to serve the aerospace market?

SEDEC is to attract a tier one company to the region. The focus is to diversify existing companies into supplying to the demands of the aerospace industry. "If we have a company within NAFTA with regards to the mutual recognition of standards and certifications within the aerospace industry. If this agreement is signed, it will be a significant catalyst for the aerospace industry in Mexico. Imposing mutual recognition of the standards, will allow companies in Mexico to certify their products within the country without having to go to the US.

Do you have a final message for the international aerospace community?

The challenge is to still convince OEMs to certify their products within the country. The focus is to diversify existing companies into supplying to the demands of the aerospace industry. "If we have a company within NAFTA with regards to the mutual recognition of standards and certifications within the aerospace industry. If this agreement is signed, it will be a significant catalyst for the aerospace industry in Mexico. Imposing mutual recognition of the standards, will allow companies in Mexico to certify their products within the country without having to go to the US.

What are the key pillars that SEDEC wants to focus on so as to better develop the aerospace industry in Monterrey?

SEDEC’s strategy is to attract the joint ventures or partnerships with local suppliers in order to fulfill their needs and requirements. The industry has been developing at a significant rate and we are aiming to complete the development of the different parts of the aerospace sector. The next step for SEDEC is to attract a tier one company to the region. The focus is to diversify existing companies into supplying to the demands of the aerospace industry. The regionalization within NAFTA with regards to the mutual recognition of standards and certifications within the aerospace industry. If this agreement is signed, it will be a significant catalyst for the aerospace industry in Mexico. Imposing mutual recognition of the standards, will allow companies in Mexico to certify their products within the country without having to go to the US.
The Monterrey aerospace industry and the especially in metal mechanics, and we also Nuevo Leon has a very strong and developed for suppliers in Mexico and this resulted in being exported to Europe. Frisa and MD Helicopters do source their suppliers from Mexico and are taking part in supplier development of the region.

What is Monterrey Aerocluster's strategy in terms of developing the supply chain?

The cluster will continue to try and develop purely local supplier companies as opposed to attracting foreign suppliers. The cluster acts as an intermediate and makes contact with the supply company. CAINTRA has 3,000 manufacturing companies and, as we have an alliance with them, we have access to their database. The cluster will thus source suppliers from the CAINTRA database amongst other databases. After initial contact is made, we will support the contact as to build a good relationship with the company.

The most important thing for the cluster is to obtain funding for supplier development. The biggest challenge is that many local suppliers do not have the certification, capabilities or knowledge to operate in the aerospace industry. The cluster will conduct consulting experts to do assessments of what is needed from a company in them to develop into a supplier that can service the aerospace industry. We will also assist the supplier companies with training and educational courses.

What are Monterrey Aerocluster's major goals that you would hope to achieve within the next five years?

Our main focus is to be much better positioned in different strategic sectors within the aerospace sector through the active collaboration of the triple helix. This means that Mexican companies should be taking?

Aerospace represents around 20% of our business. Frisa's expansion into the aerospace industry has proven to be a very strategic one as this sector is generally counter-cyclical to our other areas of focus such as oil and gas. The general thinking is that the skill of Mexican engineers is the main reason why Mexican companies should be entering the aerospace sector. For all of these reasons, the barrier to entry for the aerospace industry will always be high. It requires a long-term strategy in order to develop a supplier in this sector.

Can you provide details of Frisa's products and their application in the aerospace industry?

Frisa's products are seamless rolled rings for application is almost entirely in the aerospace industry. We have noticed that although the big companies, the aerospace sector plays a very large part in their operations. The exception to working in different sectors to MD Helicopters, which is an OEM that works only in the aerospace industry. MD Helicopters is the only military OEM in Mexico, and is ITAR-certified.

In 2000, the government had interest in developing a new public policy for the state, in particular to promote research and development (R&D), innovation, and design. A research study was done with the result that it was decided to adapt the Basque model from Spain. Different programs to support R&D were created as well as the development of nine clusters for the nine different strategic sectors in the region. In 2008, a legal organization for the aerospace industry was created. The aerospace industry was created based on a triple-helix model of industry, education, and government working together. At that time, the council consisted of six members from the industry, two universities, and two members from government. Over the years, the association has grown significantly and in 2013, we decided to include maintenance, repair and overhaul (MRO) companies in the cluster. The cluster now consists of both manufacturing and MRO companies.

The Monterrey Aerocluster promotes and supports all initiatives that can support the industry. Education and specialized training is very important, and the cluster is responsible for promoting this in the industry. The cluster will also be involved in helping companies to obtain certifications. The aim is for our 35 members to collaborate and create projects to promote and develop the industry.

Where is the major market for the supplier companies? Is it to the United States or mainly to tier-one and tier-two suppliers in Mexico?

The supplier companies operate in both the United States and Mexican. We have noticed that although the big OEMs and tier one companies based in Mexico states that they want to develop rapidly the local supply chain, it is a process to develop a supplier-base in Mexico. 98% of our sales in the aerospace industry is to the United States. We have recently been exporting components to Brazil, China, and the United Arab Emirates. We have also been able to source components from Europe, Japan, and the United States.
At what point did HEMAQ begin operating in the aerospace industry and how important is this sector for the company?

Mexico has a strong expertise in the metal mechanical processes and HEMAQ has leveraged this to serve many industries that operate in Mexico. We noticed very early on the trend of aerospace business arriving in the country. Our involvement in this sector really took off with a project in which we were approached by a very large European aerospace company that seen our capabilities and saw that they matched their requirements. After a serious dialogue we were granted this project that has since turned out to be far more productive with the use of our machines, our processes and our engineering definition of what they needed. For HEMAQ this opened up our eyes to the nature and requirements of the aerospace industry. Following this, we expanded our ISO certification to the AS9100, not because we were required to, but rather to let our staff better understand the aerospace quality systems that govern the sector. Today, aerospace represents 35% of our business.

What are the main challenges and opportunities in diversifying into the aerospace industry? HEMAQ ensures that its staff is flexible and highly competent in all sectors and when such does not have a team only dedicated to aerospace. The country’s rich history in metal mechanical processes gave us an advantage of understanding what was needed from this sector. The challenge came with the jump to using more exotic materials such as titanium and special alloys, which had not previously been processed in Mexico. We maintain that the key factors in the aerospace today throughout the world are quality, compliance, productivity and competitiveness. As long as you guarantee these, you will be successful.

Why are people outside of Mexico somewhat unaware of Mexico’s capabilities?

We have not been able to fully share our success stories outside of the country, which is one of our biggest challenges. The international aerospace community needs to be made aware of what is happening here. As an example, Monterrey is home to one of the three aerospace forging companies in the world. There are huge facilities in the States of Sonora, Queretaro, Nuevo Leon, Baja and Chihuahua that are playing vital roles for companies’ global operations. The latter state is the location of the number one machining shop for a huge U.S. corporation, which operates over 1,100 CNC machines. Companies that do migrate to Mexico find that they achieve success in a far shorter time than they expected. From their site in Queretaro, a very well known original equipment manufacturer achieved a level of performance in year three that it did not expect until year seven.

As President of FEMIA, do Mexican small and medium-sized enterprises (SMEs) that want to serve the industry have sufficient access to government assistance in diversifying their operations? It is nothing new that in Mexico we have a tremendous challenge related with financing. Unfortunately for more than 30 years, the Mexican Government and our government has been extremely limited, and this is a missing link that definitely affects supply chain development. However, one needs to also understand that getting involved in the industry requires a profound shift in mentality due to its different culture. Patience and determination are key, and too often SMEs switch to an easier, more accessible industry. The key is to get in on this platform and understand what is happening in the industry. This plant is the most vertically integrated of all our facilities with nearly all secondary processes carried out in house. This means that in Monterrey’s case, we have the human resources, the experience and better chances at succeeding in important training programs. Another benefit is being more sophisticated and more involved with more with higher-value processes such as systems integration and design.

What are the key services this facility is able to offer the aerospace industry? As President of FEMIA, I see our strategy as being to offer the aerospace industry a prime supplier of components and structural parts. For landing gear, airframes, and machining. Our main Mission is to become a prime contractor to the aerospace industry. How important is your membership to the Monterrey Aerospace Cluster and what role does it play for your company? Today our core competency is in sheet metal fabrication of structural components for fuselage. We also have additional manufacturing cells for the machining of solid plate, primarily aluminum, for components that are primarily for fuselage and engine applications. Today, we need to develop those that are efficient and oriented towards to the future needs of our customer. Another challenge for us will be keeping pace with global advances in technology and ensuring that we are in line in terms of new manufacturing processes.

Can you introduce Noranco with a bit of background on the corporation? Noranco is a manufacturing group of eight centers of excellence for manufacturing in Canada, the United States and Mexico. The company began in Canada and through acquisitions and organically has grown rapidly over the past 10 years. The company is a prime supplier of components and structural parts for landing gear, airframes and engines. The company has also been involved in the aerospace industry for nearly two decades and is oriented to metal mechanical processes.

What were the initial opportunities identified in Mexico? Mexico continues to be an attractive destination for investment. Globally the country is becoming more associated with the aerospace industry. Noranco expanded to Mexico in 2014 through the acquisition of an existing facility. The reason that Monterrey was chosen in particular was because of the available talent that has been nurtured by the city’s rich history in industry. Today, universities such as Tech de Monterrey and UANL are playing an important role in supplying highly qualified human capital to the aerospace sector. The decision to expand through acquisition rather than start from scratch was a greenfield was taken in part because of the firm infrastructure that the previous company had in place, particularly with regards to human resources.

What geographic market was this facility established to serve? In the short term, Noranco’s facility in Monterrey will be more oriented to balancing the footprint of the corporation in North America and will take on processes that are not necessarily well suited to our other facilities due to the costs associated with labor. Looking to the future, I foresee more prime contractors arriving to Mexico and we are positioning ourselves for when those opportunities arise.

Could you introduce HEMAQ with a brief history of the company? HEMAQ was founded in July of 1988 as a machine-tool distributor in Mexico. Just a few months into our operations, we had not previously been processed in Mexico. The company began in Canada and through acquisitions and organically has grown rapidly over the past 10 years. The company is a prime supplier of components and structural parts for landing gear, airframes, and engines. The company has also been involved in the aerospace industry for nearly two decades and is oriented to metal mechanical processes.

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What opportunities did Viakable identify within the aerospace industry as to diversify into the sector? The aerospace industry in Mexico has grown significantly and will continue to grow in the years to come. There are international players that are moving into Mexico, which is making the aerospace sector a very attractive industry for business. Viakable’s mission is to play a more active role within the aerospace sector even if it is through acquisitions.

What is the scope of the products that Viakable is offering to the aerospace industry? Currently we have a limited scope of supplies, but the objective is to offer the full basket to our customers. This will include from conventional wires up to high-end products. To achieve this objective, Viakable would have to add additional capacity. One way to grow quickly is to acquire a company operating within the aerospace industry.

With regards to the manufacturing plant in Monterrey, is there a part of the facility that will facilitate growth within the aerospace industry? Growth within the facility will depend on what acquisition is made. If the partner that might acquire is big enough and has better structures, we might move our existing capacity to their facilities. Viakable does have the capabilities in the Monterrey plant to serve the domestic aerospace market. The certifications processes are difficult. We had to overcome substantial obstacles as to obtain the preliminary certifications. Military audits are a requirement for certification.

What is the potential in Monterrey in terms of academia? Is the source of human capital for Mexico viable and with regards to the aerospace industry something that is readily available in Monterrey? Monterrey is known for its metal mechanical works, as it is in this area where it has the highest skills and strengths. The region has a strong supply of good technical workers. The automotive industry in Monterrey is mature and, as the aerospace industry requires similar workforce skills, it is readily available. Monterrey is a city of immigrants and a significant amount of young engineers seeks work in this region. What capabilities does Monterrey possess in order to grow the aerospace industry? Monterrey has excellent technical universities that can supply outstanding engineers to the industries. The aerospace industry in the region is not yet as strong as in other parts of Mexico. For the car industry to grow faster, we need to have a major original equipment manufacturer (OEM) in the region, so as to attract suppliers to diversify into the aerospace sector. The government should try to attract OEMs to the region to promote investors’ interest in the aerospace industry.

What goals would Viakable hope to achieve within the aerospace industry over the next five years? Viakable defines success as when one reaches a point where one can interact with the designers in the industries. Thus, success is exceeding the point of being just a supplier of commodities. Our goal is to reach the point of success and start interacting with designers within the next few years.

Do you have a final message for the industry? Viakable currently has a limited scope of supplies, but the objective is to offer the full basket to our customers. This will include from conventional wires up to high-end products. To achieve this objective, Viakable would have to add additional capacity. One way to grow quickly is to acquire a company operating within the aerospace industry.
Recently we have received visits from many quality control systems and design capacity. Our engineers and operators were trained to work with these materials when GE supported us to develop the business. We have developed a Training System to certify our operators and engineering personnel internally.

In terms of Monterrey and Nuevo Leon, there are great opportunities for companies to get into aerospace. Can you elaborate on the advantages that Monterrey has for aerospace companies?

In Monterrey there is a lot of human talent. Monterrey is a constantly growing industrial area and located nearby USA which is an important advantage for export opportunities.

What kind of support do you receive from being part of the aerospace cluster and how important is it for the industry to grow?

Promotion and training. It is of a big importance to count on an organism that helps to promote the industry overseas.

Do you source materials locally or do you receive them from your client directly?

Now that we are working with Frisa, they produce the alloys and send them to us. We then manufacture the parts using these materials and send them back to them.

Please describe your facilities?

We currently have 130 employees in total and over 60 CNC operational machines for turning, milling and laser cut. As for territory, we have 5,000 square meters for growth opportunities. During the last 2 years we have been investing in new 5-axis functionality machine, 2 small size machines for more specialized parts, and one large machine for more specialized parts. We are also implementing an administrative software RPS to keep track on each part and have strengthened our quality control systems and design capacity. Recently we have received visits from many aerospace companies looking for a small parts manufacturer and they have asked us to have the CATIA software to be able to offer quotes on the products they are looking for. We can perform turning, milling and CMM inspection processes for aerospace.

What percentage of your business is aerospace?

About 20%.

The aerospace industry is very specific regarding certifications. How do you source your human resources so the people that work here are trained and qualified?

Our engineers and operators were trained to work with these materials when GE supported us to develop the business. We have developed a Training System to certify our operators and engineering personnel internally.

Even though the new market was a challenging Texmaq also saw the opportunities and decided to get involved. It took several years to comply with the industry requirements. After accreditation, we attained Honeywell as our first aerospace client and we are still providing services to them today. Texmaq also had opportunities in other sectors like oil and gas. We saw significant growth in the oil and gas industry and 65% of our 2014 sale shares were in this segment. In the present year, there has been a decrease in the oil and gas sector and the company started a diversification program. We look for new opportunities and one of them was with Fokker Aerostructures. The project is still in the development stage, but it will be an important project to Texmaq. In terms of the aerospace sector, the expectation is to grow from 3% to 20% sale shares in the next five years. Growth in the aerospace sector has not boomed as there is no OEMs or Tier 1 companies in the region.

What is the profile of companies that the government should be targeting to attract?

Based on the history of the State, the government should focus on attracting aerospace companies to the region. With this, more local manufacturing companies should be involved in the aerospace industry. Programs should be in place to target the requirements of the quality systems of this market. Through the aerospace cluster we can build a supply base which is that the supply chain is not established completely. Raw materials and some specialized processes are still being imported from the US. For these specialized processes, they need to have a NADCAP certification. As it is not very difficult to attain AS 9100, if you have an ISO certification, the government should have a new program to help companies to achieve it. With regards to Texmaq, we participated together with an educational institution to achieve our AS 9100 certification.

What is Tecmaq’s strategy for growth in the aerospace industry and what goals do you have at Texmaq?

Tecmaq has been operating for 15 years and we are a company dedicated to CNC machining. The company focuses on providing production parts to our clients to satisfy their market supply chain. With turning and milling capabilities we serve several markets including oil and gas, fluid transmission, fluid, transportation, and aerospace. Texmaq has grown substantially in the 15 years that we have been operating as we started with only four machines. Currently we have 80 machines and 200 employees. Pricing, quality and performance are very important if you want a business to be successful. If these aspects are covered, the opportunities to grow the business are there. Our mission is to form a strategic partnership with our customers. The opportunities in the market are still very high as the local supply chain is still developing.

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Can you provide details of the transition process that Mimsa underwent?

It has certainly been a challenging transition. The first requirement to be considered as a supplier was for us to implement our supply chain closer to home. Following secondary processes it is Mimsa's responsibility to carry out all final inspections prior to sending the products to our client.

How important is Mimsa's membership in the Monterrey Aerocluster?

Being a member has certainly been useful in securing government funding and investment. One issue that the cluster is currently collaborating to resolve is the lack of a shared training center. The industry in Monterrey is not as established as in Baja California or Queretaro and does not have technical schools, but it is realistic for companies to buy the metals. For secondary processes we are currently sending our products to companies in Chihuahua. For future projects we will be using Monterrey-based Noranco with a view to bringing our supply chain closer to home.

With regards to the tailored platform Dynamic Logistics has for the aerospace industry, what are the typical demands of this industry?

In order to meet the demands of Mexico’s Aerospace Industry Dynamic Logistics became a member of the Aerospace Logistics Group (ALG). All members are independent companies with many years’ experience in the aerospace industry – joined together to provide seamless global coverage. Dynamic Logistics understands the industries requirements, particularly by air and sea, and our customers worldwide are able to enjoy a team with the knowledge which is rarely by our competitors.

Can you elaborate on the software and technology that Dynamic Logistics uses to keep up with industry demands?

Dynamic Logistics uses a real-time freight forwarding system that is called Soft Cargo. This is a system where we input all our information and where we offer a service platform for our customers. Customers can login to the system and keep track of their orders. Mexico has a negative reputation concerning security, and certain industries have difficulties with this issue. We offer a GPS system that puts a device inside the container or pallet as to keep track of products and to make sure that they are following the planned route. Through this new technology, we are able to measure not only location, but also temperature for perishable goods. The real time GPS system will send alerts to the customers’ e-mails and the route chronology can be accessed online. There are different systems for different industries, depending on the demand. If you are in an industry that has high security risk, the GPS also has a light sensor that will send an alert if the container or box is opened during the transit. All this will happen in real time allowing our customers to have a quick response time to any inconvenience.

Besides security, what logistical challenges coincide with operating in Mexico, particularly in the aerospace industry?

In some towns the police and authorities make logistical services difficult due to road closures. As clusters are developing and creating more opportunities, local suppliers are starting to offer their services in these clusters. When companies enter Mexico, they consider if the local supply chain will be able to meet their demands. Location is therefore very important. The local government is very involved in trying to bring in foreign investments into their states, but for exports location is the most important. Monterrey is a great location as it is very close to the US border and has quick access to main ports. It has a very well developed service industry because of all the industrial activity that has been growing for many years. •
What is the typical profile of customer that Grupo Forem companies are working with in the aerospace industry?

FY: Current aerospace customers in the aerospace industry include GE, MTU, Frisa, Honeywell and MD Helicopters. For these clients we are providing primarily mechanical testing services at room and high temperatures.

RL: We currently have testing laboratories in Monterrey and in Queretaro. We recently made a large investment into a facility in Mexico City, which we will have operational early 2016. With this addition we will be strategically located to serve a rapidly expanding aerospace market. The challenge we now face is that prime contractors are still generally using suppliers in either the United States or Europe. Our goal now is to persuade companies of the available local capabilities. Breaking into the aerospace supply chain is not a quick process. It will take us the maximum time they have to fill a position, which is a plenty of time. A problem we are seeing in Queretaro is that as a result of the aerospace boom there are far more students graduating with aeronautical degrees and fewer that are focused on metrology, calibration and testing.

Can you talk about the challenges you faced and the support you received in gaining NADCAP accreditation?

FY: Obtaining NADCAP accreditation was certainly a challenge, but we saw it more as an opportunity to optimize our existing quality system rather than simply adjust our model to meet the requirements. Gaining this certification has involved a process of investing in new equipment, integrating newer technologies and developing a higher level of human capital.

RL: One challenge in particular was to understand that shifting from the automotive industry to the aerospace industry required a fundamentally different mindset. With regards to the support we had for this process, Grupo Forem was granted some funds from the Monterrey Aerocluster. However, the availability of these funds is not well publicized enough to the other companies wanting to expand into aerospace.

What is the scope of services that Metalinspec Laboratories offers to the aerospace industry in Mexico?

FY: Typically our aerospace customers require mechanical tests at room temperature or high temperature. These include tension, compression, hardness, stress rupture, and creep tests. Metalinspec Laboratories has a Commercial representation in Mexico for Westmoreland Material Testing & Research in the United States to offer any service that we are unable to provide in Mexico.

RL: Metalinspec also has an accredited machine shop, which is used to take apart the larger components that we receive. This is important, as we have found that dimensions of a sample affect the reliability of a test result. We are currently in the process of migrating the NADCAP accreditation to the machine shop operating in Queretaro.

How does Grupo Forem fulfill its human resources (HR) needs and what challenges do you encounter in sourcing human capital for the testing industry?

RL: We have a strong HR department and the maximum time they have to fill a position is two months and in general this is plenty of time. A problem we are seeing in Queretaro is that as a result of the aerospace boom there are far more students graduating with aeronautical degrees and fewer that are focused on metrology, calibration and testing.

Do you have a final message?

RL: Grupo Forem is divided into two business segments. One is dedicated to the metal mechanic industry and the other is involved in quality-control equipment, metrology and the testing of materials. The latter business segment is divided into three companies. Metalinspec began in 1989 as a small operation representing manufacturers of quality-control equipment in Mexico. As this business grew we created Metrolab and began offering metrology and maintenance services. For this we built the first-ever underground metrology laboratory in Mexico. Being underground we are able to have much more control over temperature, humidity and vibration, the proper environmental conditions to carry out the testing. Today Metalinspec Laboratories has aerospace customer approvals from GE, Honeywell and MTU.

What is AEISA's business model and what value-added services can it offer in addition to being a distributor of products?

AEISA is a distributor of NDT equipment. We have the advantage of representing brands that are world leaders in this field such as Magnaflux, Rohmann and Yxlon. These companies have extensive experience in the aerospace industry, which AEISA is able to leverage to better serve our customers from this sector.

Can you introduce Asesoría y Equipos de Inspección, S.A. de C.V. (AEISA)?

AEISA is a family-owned company that was established in 1979. We specialize in the field of non-destructive testing (NDT), which, when the company began, was used mainly in the oil industry for the inspection of pipelines. After the global trade agreement was signed with the United States, manufacturing began to arrive to Mexico, and we began to grow the company with customers in the automotive industry. Since the aerospace boom in the mid 2000s, AEISA identified this sector as an important driver for growth. Today the aerospace industry accounts for 15% of our overall sales with higher concentrations from our offices in Chihuahua and Queretaro. What is AEISA's growth strategy over the next five years?

NDT is growing in technology day by day so our efforts will be focused on incorporating more product lines and finding new techniques. We are finalizing our ISO17025, which is the standard needed for the calibration of equipment. We are planning to have a fifth office to be able to better attend to our customers and increase our customer base.
to better serve an existing customer of ours, Frisa. This laboratory was built according to Frisa’s requirements and offers mechanical testing, metallurgical testing, and non-destructive testing (NDT).

JR: An agreement was made between Frisa and Exova to establish a laboratory in Monterrey. In doing this, Frisa would no longer have to send its testing services to the United States. For Exova, it was a chance to gain a foothold in Mexico’s rapidly expanding aerospace industry and develop the testing capabilities of the country. A long-term agreement was signed with Frisa to guarantee enough business to make the investment worthwhile, and Exova has since been successful in expanding its base of customers in Mexico.

What are some of Exova’s key competitive advantages over other third party inspect companies in Mexico?

FR: Frisa’s most competitive advantage is that it can leverage its worldwide presence to benefit its customers here in Mexico. The Exova brand name is well known and one that our customers can trust. We ensure that there is good synergy between all Exova’s facilities so that a customer in Mexico requiring a test that we are not able to carry out here can take advantage of our vast network and have the testing performed at another Exova facility. This is also true for other Exova facilities; they can take advantage of our services in Mexico.

What are the main services Exova is currently providing for the aerospace industry in Mexico?

JR: Mechanical testing is our main testing capability. For this, we can provide tensile testing at either room temperature or elevated temperature. We also provide hardness testing, stress rupture and impact testing. FR: NDT is the second largest part of our business, as the demand has grown substantially in recent years. We provide a range of NDT methods and next year we hope to add ultra sound testing to this portfolio.

JR: We also provide state-of-the-art metallurgical testing services.

Do you have a final message for our GBR readers?

FR: Exova’s success in Mexico is on the back of local talent in the aerospace industry, particularly in Monterrey. There is major excitement within the aerospace industry as it is still an emerging market.

What developments within the aerospace industry do you foresee for the next five years?

Tecnológico de Monterrey would like to be a player in the higher-value aspect of the industry. There is a demand for higher knowledge and that is where we want to play a role. The university has an open mind and is willing to provide for any needs of the industry.

Do you have a final message?

There is a growing incentive from Mexican institutions, which support science and technology, to collaborate on research projects. With regards to the main challenges in Mexico, universities will collaboratively think of ideas and collectively search for solutions. There may not be as much collaboration within the aerospace industry, as it is still an emerging market.

To what extent is the university trying to encourage entrepreneurship that would in turn foster Mexican innovation within the aerospace industry?

One of the major characteristics that the university encourages in students is entrepreneurship, and we see ourselves as a world leader in entrepreneurial ventures. We want to provide our students with a way to channel their energy into new businesses, innovations and entrepreneurial initiatives that is of value to society. The university’s aim is to have a significant and positive impact on the economy of Mexico.

What developments within the aerospace industry do you foresee for the next five years?

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Do you have a final message?

Mexico has a significant amount of opportunities in the aerospace industry. The country has a strong human-capital platform to offer, and there is a great manufacturing culture.
The center was founded in March 2012 to boast a strong and solid base to offer programs in this discipline. In August 2007, UANL began offering the Aeronautical Engineering program and began to look into the idea of having a research center in the field that would develop highly specialized human capital. That is how UANL began to design what would become the Center for Research and Innovation in Aerospace Engineering (CIIIA). Towards the end of 2009, the cornerstone was laid using both federal funds from the Secretary of Public Education and the National Council of Science and Technology (CONACYT) and university resources. The center was founded in March 2012 boasting 20 full-time faculty members with doctorates in fields related to aeronautics. CIIIA offers bachelor’s degrees, where we train aeronautical engineers with a strong tendency towards design, structural design and materials. Students are required to design and build a full-scale model of a plane during their last year. CIIIA began to integrate the doctoral program with CONACYT to offer the same scholarships as the Master’s degree.

Could you provide a brief introduction to CIIIA and an overview of the circumstances that led to its establishment?

PZ: The CIIIA project and the idea of developing aeronautics here in Nuevo León began in 2006. That year, the Autonomous University of Nuevo León (UANL) noticed how foreign investment was growing in our country’s aeronautics sector and that in that same year only one institution of higher education offered an aeronautics-engineering program. In that moment, UANL set itself goals to establish a strong and solid base to offer programs in this discipline. In August 2007, UANL began offering the Aeronautical Engineering program and began to look into the idea of having a research center in the field that would develop highly specialized human capital. That is how UANL began to design what would become the Center for Research and Innovation in Aerospace Engineering (CIIIA). Towards the end of 2009, the cornerstone was laid using both federal funds from the Secretary of Public Education and the National Council of Science and Technology (CONACYT) and university resources. The center was founded in March 2012 boasting 20 full-time faculty members with doctorates in fields related to aeronautics.

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Are these degrees unique in Mexico and how do you tailor them to meet current needs in the aerospace industry?

PZ: As a university with a long history, we have a strong link to industry in all our fields. Especially since Nuevo León is a state with strong industrial vocation. Though the aerospace industry in Mexico is relatively new, our existing links to the automotive, mechanical, and metallurgy industries made it easy for us to build connections with the aeronautical industry. We have students that have worked with MD Helicopters, Fitéo’s aero-space division, and we are beginning to work with Noranco. Our students also participate in exchanges with other research centers in Mexico and abroad. In 2014 we began to collaborate with Airbus to maintain a training facility with simulators to train airline personnel.

Could you talk about what’s inside the CIIIA building and where the funds are being directed to develop your equipment?

RG: We have 12 very specialized laboratories and in each we can see cases in which projects are being developed. For example, in composite materials, we are seeing projects from companies where we are developing parts in carbon fiber and teaching companies about the development and design process of making these parts. Given the integration of industry within Nuevo León, a lot of automotive companies are rethinking what they are doing and looking at how to take advantage of composite materials. Not only are we teaching the process but also the quality control tests they need to go through to ensure they can withstand their intended use. We have an avionics laboratory where the researchers are working in the development of the electronics and algorithms associated with controlling drones. Another important topic we research is material corrosion and failure probabilities. There is an advanced manufacturing laboratory that serves other labs by producing molds and prototypes. There are design and simulation rooms where various clients ask us to conduct simulations on the parts and materials they are asking us to develop. We monitor what software and technologies companies are using so that we can adapt to use these technologies. Can you adapt to use these technologies so that we can adapt to these technologies? It is very important for them to achieve their potential. At any moment, Mexico is going to boom, and when it fully realizes its potential, the world will see what it can offer -

PZ: Not in today’s world because we are still in an infant stage in the eyes of others. In my experience, hosting visitors from around the world and we do not expect what they see here because they have a different vision of Mexico. We are not perceived as what we are capable of and we do not project our capabilities abroad. People are surprised by the work that we are doing here. Several years ago, Mexico consolidated itself as an automotive hub, and we hope it will consolidate us as an aeronautical hub as well.

RG: We have an enviable geographic location and innovative people. Part of our role is to help people pursue their ideas. Our students, on average, come from low-to-middle-income families and do not have the resources to pursue their ideas. The support that we can give them is very important for them to achieve their potential. At any moment, Mexico is going to boom, and when it fully realizes its potential, the world will see what it can offer.

INTERVIEW

How important is academic participation in the development of Mexican suppliers to the aerospace industry and what role is UANL playing to approach the ‘inverted pyramid’ model that prevails in the Mexican aerospace sector?

RG: It is very important for the country, and especially for the State of Nuevo Leon, that we incorporate the development of Mexican suppliers to the aerospace industry. We are obliged to keep ourselves on the forefront of new technologies that surface every day. The UANL is currently in the process of certifying its laboratories that specialize in aeronautical engineering with the goal of offering quality services to companies that supply the aeronautical industry. This is on top of the courses on AS9100 and NADCAP, which are requirements in this sector. This will incite a greater link between university-industry-government that will develop local suppliers as well as increase the industrial infrastructure and aeronautical services.

Are there any projects that you are particularly excited about that are playing an important role in global aerospace?

PZ: Our biggest project at the moment is with Airbus, and it has motivated the institution to expand its facilities and capabilities. This project is intended to establish a training facility in aircraft maintenance that is up to the standards of those in Miami, Toulouse, China and other parts of the world. Today, Airbus has five of these centers and this would be its sixth. This center will benefit from the research of many of our students. This center is targeted at training people who maintain the electric systems, people who repair the aircraft. In aeronautics, being able to repair a part made of composite materials requires a high degree of specialization and knowledge. This center will bring a lot of benefits to Nuevo León and Mexico.

Does the international aerospace community fully recognize the engineering capabilities of Mexico?

RG: Not in today’s world because we are still in an infant stage in the eyes of others. In my experience, hosting visitors from around the world and we do not expect what they see here because they have a different vision of Mexico. We are not perceived as what we are capable of and we do not project our capabilities abroad. People are surprised by the work that we are doing here. Several years ago, Mexico consolidated itself as an automotive hub, and we hope it will consolidate us as an aeronautical hub as well.
Eduardo Alvarez, operations manager for AviHel, a small aviation company that operates and maintains helicopters out of the Aeropuerto del Norte. However some feel that the MROs and manufacturers in Monterrey have little in common, particularly with regards to a localized supply chain. “The advantage of synergy between MROs and manufacturers in Mexico does not affect us as a company” said Roberto Marcos, vice president of Monterrey Jet Center. MROs tend to require used parts, which can only be sourced from the U.S. While the benefits of shared training offered by the Aerocluster do exist, many MROs found at the aeropuerto del Norte are too small for this to have any real benefit.

Certification is just as important for maintenance companies as it is for manufacturers in the aerospace industry. DGAC is the Mexican standard that most companies operate to, though it is not internationally recognized and as such does not allow businesses to work on aircraft coming from outside of Mexico. For a company wanting to attract foreign aircraft they must first receive FAA approval. This is an expensive process and not an important step to take for a lot of the companies here that are satisfied with the level of business the domestic aviation offers. Monterrey Jet Center, on the other hand, deemed this approval necessary in order to grow. “Although being a certified service provider is costly, it is still in the best interest for repair stations to become FAA certified as it is an investment into the success of the company,” said Marcos.

“Certification broadens the company’s customer profile and we have many customers from the U.S.” Though it may not be seen as a key driver for the growth of Nuevo Leon’s aerospace sector the MRO market is essential for supporting Mexico’s rapidly increasing domestic and international business aviation. Further integration between maintenance shops and manufacturers will only bring mutual benefits to both parties.

Roberto Marcos
Vice President
MONTERREY JET CENTER S.A. DE C.V.

Can you give a brief introduction and history of Monterrey Jet Center?
Monterrey Jet Center has been in the aerospace business for about 36 years. The first facility was situated at the international airport, but as the company grew we established an expanded facility where we are currently situated. The company offers repair and maintenance services to the aerospace industry. We mainly do repairs on Hawker, Lear, Cessna Citation, and KingAir aircraft. The company was also recently granted a contract as an authorized service center (ASC) for Embraer.

Can you elaborate on the process of how Monterrey Jet Center became an ASC for Embraer?
Our indirect relationship with Embraer started in 2000 when American Airlines and Continental Airlines started flying Embraer aircraft to Mexico. Both airlines needed a company to support their maintenance in Mexico, and Monterrey Jet Center was the only company that could offer them those services, as we were Federal Aviation Administration (FAA)-authorized and had the required certifications.

A few years later, when Embraer started to promote their Legacy line in Mexico, they needed a repair center in the country. The only company with the knowledge, experience and certification to deliver the required services was Monterrey Jet Center. We then signed the contract and become the ASC for Embraer.

When did Monterrey Jet Center obtain FAA certification and what were some of the challenges that you encountered in the process?
To get a certification as a FAA-authorized service center we had to go through a series of quality-control systems. We also had to prove that there was a need for a FAA repair facility in the country. With regards to EASA approvals, Monterrey Jet Center decided, for the time being that EASA certification is too expensive to get as there is not a huge European market here in Mexico.

AFA certification requires that the company follow a manual that includes all aspects of the business like warehousing, presentations, tools, qualified personnel, and mostly procedures. It is sometimes a challenge to comply with the rules and regulations of the manual. Certification can be challenging.

We are inspected annually by FAA inspectors to confirm that we are still compliant with all the standards. Although being a certified service provider is costly, it is still in the best interest for repair stations to become FAA-certified as it is an investment in the success of the company. Certification broadens the company’s customer profile and we have many customers from the United States. We do not have many European customers and therefore are currently not looking to get EASA-certified.

What is the company’s strategy for sourcing the technical talent that is required in the business?
In terms of training, the company has an agreement with the Autonomous University of Nuevo Leon (UANL). Students do practical internships at Monterrey Jet Center and once they have finished their academic studies, we have a choice to employ them. We thus source technical talent directly from academic institutions.

Is there a collaborative effort between maintenance, repair and overhaul (MRO) companies and manufacturers to develop a local supply chain supporting the aerospace industry?
The advantage of a synergy between MROs and manufacturers in Mexico does not affect us as a company. In our business, we are a one-stop shop, which differentiates the company in the competitive market.
What is the company’s strategy for identifying the types of aircrafts that you will work with?

In the private sector, AviHel grows and gains customers through recommendations. The company’s growth strategy is to offer efficient and quality services at low cost. AviHel can handle both helicopters and fixed-wing aircraft. Our market is currently 60% fixed-wing aircraft and 40% helicopters. Helicopters are, however, more profitable and thus we are working to expand our capabilities in terms of turbine engines. We are also looking into working with larger aircraft.

Can you elaborate on the facility and equipment that you have here?

AviHel has the VPX and RAD’s to analyze vibrations on helicopters, on aeronautics we have some Aerotest equipment’s like IFR 4000 and IFR 6800 some equipment from Barfield and other panels to test headphones, HIS, etc. Technicians are equipped with all the tools that are needed to do maintenance and repairs on aircrafts and helicopters. The company has also two, two-son runway systems, hoist-to-handle engines, transmissions and complete aircrafts, we also have special tools for Bell 206, 407, 412, Airbus Helicopter AS350 and EC120, King Air Series, jacks, work tables, hydraulic press, tug, abrasive equipment, borescope, electric power plant, and others.

Is the staff split between helicopters and aircraft or can every staff member work on both?

We have very experienced staff, who are split by areas and equipment. One team of technicians works only on fixed wing, the second on rotating wing, and the third team on aeronautics. The people who do the overhaul on helicopter components belong to rotating-wing team. However, some technicians can work on both fixed and rotating wing.

What are the quality requirements of this type of business and what are the quality systems that govern AviHel’s operations?

Mexico has a safety management system (SMS) that focuses on ensuring quality. The system has four facets and currently we are working on the second phase. AviHel was the first MRO facility to a pass and attain accreditations for one of the program.

Accreditation is authorized by the DGAC agency. This is currently the quality system that the company is complying with and in 2016 we will complete phase two and three of the program. Although SMS is not internationally recognized, it is similar to a program of the Federal Aviation Administration (FAA). We hope that as soon as we complete the SMS, it will be easier to get accredited by international norms and standards. We will also work on the AS9100 in 2016, and this will help us to get accredited as an FAA repair station on the future.

How long has AviHel been a part of the Monterrey aerocluster and what has the company’s role been in the industry?

AviHel has been part of the cluster for about a year and a half. In terms of the aviation industry and maintenance, repair and overhaul (MROs) companies, the cluster is still relatively new and is learning to help one another and learn from each other. Training is sometimes difficult, as often one has only two or three technicians but must pay for training seven technicians. The cluster is working on implementing training programs that train individuals from various companies.

Is the specialization of Monterrey’s development in the aerospace industry maintenance-oriented?

Monterrey specializes in two branches: manufacturing and MROs. Manufacturing runs pretty well and has been growing quickly in the last eight years. Monterrey has a huge market for MROs because it is an industrial city, so we have a lot of national and international companies, both small and large, which brings traffic to our airport. Monterrey also has a great location to bring customers from other regions of Mexico.

What goals would AviHel like to achieve in the next five years?

Monterrey has to increase its capabilities as a MRO facility, achieve SMS and AS9100. These are our priorities because with quality, safety and efficiency create the base from which to grow in the right way. We also have to increase our fleet. We only have two aircraft. Finally, we are working towards providing the best possible environment and worksite for our employees.

AviHel is working on expanding its fleet and building a new facility. The company is increasing its client base and looking for new markets to expand its business.

What is the importance of the aerospace industry for Nuevo León?

For many years, Monterrey has had more potential development in the aerospace industry than any other region in Mexico, but it still has potential for substantial growth. This can be seen by its success in other industries such as the automotive. Monterrey was recently successful in attracting KIA to the region, and can have similar success in the aerospace industry.

Do you have a final message for our GBR readers?

I would encourage the international community to first turn their eyes to Mexico in general. What has happened in this country in the past ten years is remarkable, and for good reasons. Mexico can stand out from the global economy and business environment. There is much lower risk in Mexico than other cost-competitive destinations, and we are becoming well versed in the aerospace industry. For Nuevo Léon and Monterrey in particular I would draw their attention to the great education system that we have in place and the high number of engineers and technicians this state is producing. Monterrey is an industrial Mecca and its rich experience offers a wealth of opportunities to companies looking to invest.
Querétaro has every component needed to nurture the growth of local suppliers supporting the aerospace industry. Once this is achieved Querétaro will very much be seen as one of the most competitive aerospace destinations throughout the world.

- Marco Antonio del Prete Tercero, Secretary of Economic Development for Querétaro
The aerospace industry in Querétaro began with the arrival of Bombardier in 2006. This globally recognized equipment manufacturer (OEM) uses its Querétaro facility to manufacture aero-structures for its family of business jets and for its har- nesses and electrical components. Bombardier has been an anchor company and part of its strategy has been to attract other companies in the aerospace industry to set up manufacturing capacity in Mexico. Some of Bombardier’s suppliers that have come to Mexico after the company’s arrival are A.E. Potsche, PCC Aerocstructures, and Aermomiva. Beyond attracting foreign suppliers, Bombardier has created a team dedicated to developing a local supply base, whereas Airbus Helicopters, which established a manufacturing presence in Querétaro in 2013, has adopted a vertically integrated business model. Airbus Helicopters claims that what is lacking is a consolidated network of tier-two and tier-three companies supporting the OEMs and tier-one companies. Another player, SAFRAN Group, has two main companies in Querétaro, Snecma and Messier-Bugatti-Dowty, which focus on engines and landing gear respectively. Daniel Parfait, country delegate for SAFRAN Group, stated that “the challenge that lies ahead for potential companies wanting to break into the global supply chain is a matter of financing.”

Introducing the Aerospace Industry in Querétaro

The aerospace cluster of Querétaro is an international player not just in manufacturing, but also in innovation and design. • The Mexican Federation of Aerospace Industry (AMIA) views Querétaro as pivotal in growing the country’s reputation as a major international player not just in manufacturing, but also in innovation and design. •

The only challenge that lies ahead for potential companies wanting to break into the global supply chain is a matter of financing. •

The inauguration of the Aeronautical University of Querétaro (UNAQ) in 2007 means that companies in the area have access to talent that has been trained solely for the purpose of serving the aerospace sector. Initially established to support Bombardier’s harness assembly, today the university provides bachelor’s and master’s degrees, Ph.D.s., and the technical training required for personnel working on aerospace factory floors. Beyond supplying human capital, the university also takes onboarding projects from the industry and is able to combine training with serving the industry. Jorge de Velasco Rodriguez, the school’s president, said: “Every investment is focused on being as transversal as possible, with shared resources among stu- dents, researchers, and companies.” Developing the available talent in the state is fundamental to the progression of the supply chain. It provides the essential skills needed to operate computer numerical control machinery for welding and for other processes that are currently lacking in Querétaro. It also creates an environ- ment in which the state can evolve the role of design in its aerospace sector by training engineers. GEIQ, GE’s engineer- ing center in Querétaro, is leading this de- velopment with over two thirds of its staff dedicated to aviation, and is adopting a HR strategy of hiring from local schools. Currently, GEIQ has 100 engineers working on GE9X—the next-generation advanced dual rotor, axial flow, high-bypass turbo- fan jet engine used in Boeing 787 and 747-8 aircraft. President Vladimiro de la Mora boasted: “Globally, every two seconds there is an aircraft flying with GE engines serviced by Mexican talent.”

The space of Querétaro is an efficient networking platform that fosters collaborative efforts to address the needs and directions of the state’s aerospace in- dustry. The local government is continuing its strategy of attracting foreign invest- ment, but the common focus of industry, academia and government is to address the evident gaps in the supply chain. The Mexican Federation of Aerospace Industry (FEMIA), the industry’s trade association, views Querétaro as pivotal in growing the country’s reputation as a major interna- tional player not just in manufacturing, but also in innovation and design. •

The challenge facing RMYSa is to find certified secondary pro- cesses such as heat treatment and coating, and it is looking to consolidate this aspect of its supply chain. Aeroprocess TTT, part of the Spanish Grupo TTT, has identified these growing needs in Querétaro and recently began offering heat-treatment ser- vices. Meanwhile, companies throughout the supply chain are still sourcing raw mate- rials from overseas as Querétaro has no certified distributors. Alex Slouka, CEO of Omni-X MX, a tooling company that provides bending services, said: “The estab- lishment of a distribution center for raw materials in the area would mean that Omni-X would be able to offer a much more value-added product to our custom- ers.”

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What are some of the main qualities that Querétaro offers to the global aerospace community?

Being in the center of the country, Querétaro’s geographical location lends it a highly efficient logistics framework. It is favored for its proximity to Mexico City and its equidistance from ports serving Europe and Asia. Though having a population of 2 million, the state has the possibility to attract 45 million people from a radius of 350 kilometers. The business environment is important for the development of any industry and being one of the most peaceful regions in the country, Querétaro offers great security and a high quality of life.

What types of aerospace companies operate in Querétaro?

Today, Querétaro’s main areas of expertise are in the machining of complex components, aero structures, components for braking systems, engine MRO, and components for engines. Companies in the state also operate in landing gear MRO, components for landing gears, heat and surface treatments, harnesses, and flight/motion control actuation. Querétaro has the resources and capacity to branch into another area of products and processes when the demand arises.

What are the state’s main strategies and areas of focus in ensuring the growth and success of its aerospace industry?

It is important to note that a key part of the development of the aerospace industry was FDI, and it continues to be today. Without the arrival of Bombardier and the SAFRAN group Querétaro, the growth of its aerospace industry would not have taken place. The state saw the arrival of companies that have nurtured Querétaro’s reputation as a national leader in innovation and research and development. The model University of Querétaro (UNAQ) has seen more than 5,000 technical graduates since 2006. It is through the alignment of the state’s aerospace industry and government that the aerospace industry in Querétaro will truly thrive.

Two years ago, the Aerospace Cluster of Querétaro was made official. How important has this been for the state government’s efforts in supporting the aerospace industry?

With the rapid growth of the aerospace industry, its consolidation became important for the state government so as to be able to quickly and efficiently meet the demands of the companies operating within it. The Aerospace Cluster has been hugely successful in achieving this and now is helping to promote and strengthen the state’s aerospace industry and is increasing its competitiveness both nationally and internationally.

What is the most significant goal for Querétaro to guarantee the continued growth of its aerospace industry?

The first is to have a pre-existing supplier base that Querétaro can leverage. The second is to identify, develop and nurture local suppliers. The current situation in Querétaro is that there are a number of original equipment manufacturers and tier-one companies, but what is lacking is a consolidated network of tier-two and tier-three suppliers. We are working together through the Aerocluster of Querétaro to resolve this by sharing our knowledge and experience with potential suppliers and integrating small and medium-sized enterprises into the cluster. It is very important for the companies here and for the growth of Querétaro’s aerospace industry that we work together to build this base of suppliers.

We have recently begun the process of integrating small and medium-sized enterprises and modifications in the manufacturing process, Querétaro plans to change this to a horizontal one, but, in order to achieve this, it is very important for the companies here and for the growth of Querétaro’s aerospace industry that we work together to build this base of suppliers.

What is the role of the Querétaro facility playing for Airbus Helicopters’ global operations?

This plant is dedicated to the production of metallic airframes for Airbus Group. Currently, we are vertically integrated business and practically all of our production is carried out in-house. The first work package that we transferred was actually the emergency exit doors for the fixed wing A320, but future work packages will include a mix of fixed wings and helicopters. We have done things to build to print, at which point we transfer this information onto our company and begin training the employees here in Querétaro and begin training the end of which they return to the facilities in Europe for a training period at Airbus Helicopter has a long and tested experience here in Querétaro and begin training the employees here in Querétaro.

What efforts are being made to create this strong base of lower level suppliers for the aerospace industry?

With regards to establishing tier-two and tier-three suppliers, Querétaro Aeroclúster has been hugely successful in achieving this and now is helping to promote and strengthen the state’s aerospace industry and is increasing its competitiveness both nationally and internationally.

What has been Airbus Helicopters’ strategy for the transferal of technology and knowledge?

Airbus Helicopters has a long and tested experience of technology transfer. The technology that Airbus Helicopters uses is ‘train the trainer’. At the beginning of a new transfer, we invite a group of operators, engineers and quality controllers to our head office in France. We then visit the facility at the end of which they return to the facility here in Querétaro and begin training the rest of the staff.

Will Mexico become more involved in the design aspect of the aerospace industry?

The evolution of the Aerospace supply chain is a clear model that is being designed by the large corporations such as Air- bus Helicopters and Bombardier that came to build to print, at which point we transfer this information onto our company and begin training the employees here in Querétaro. When that moment arrives, the local facility shifts from work on components to become more focused on the manufacturing process. We are able to incorporate our own improvements and modifications in the manufacturing process.

The next and ultimate step, on which I believe Mexico is on the brink, is design. GE is already incorporating this into their operations and is now embracing this capability. This is the first time we have a pre-existing supplier from either Europe or North America mi- grate to a facility in Mexico to reduce their production costs. In that case, the support on our part will simply be in terms of dis- plants with our existing suppliers and managing the business that we will require from them. The second scenario is to develop a purely local company, but this case is more complex. The support will development of Querétaro’s educational system, training for Airbus Helicopters’ global operators. As a reminder, Airbus Helicopters has been present in Mexico for nearly 35 years. Since then, our activities in the country have grown steadily, and so has our commitment to the state’s aerospace industry and is increasing its competitiveness both nationally and internationally.
Having been operational in Mexico since 1992, what is the strategic importance of the country today to your aerospace operations?

Mexico has a strategic importance for Bombardier’s global manufacturing operations. At present, Querétaro conducts design, manufacturing and assembly activities of large metallic and composite structures, as well as electrical harnesses for Bombardier business and commercial aircraft. Likewise, in the context of the creation of Bombardier Aerostuctures and Engineering Services, Querétaro’s site will support the new design business objectives, leading the creation of Bombardier Aerostructures and Engineering Services, which will enable us to further strengthen our operations in the country within the new Aerostructures and Engineering Services business segment, which will enable us to further strengthen the Mexican aerospace industry.

Can you talk about the facilities you have in Mexico, the components you manufacture and how they are fitting into your global supply chain?

We have four facilities in Querétaro in which we conduct design, manufacture and assembly large metallic and composite structures, as well as electrical harnesses. Main products manufactured at the facility are: the aft fuselage of the Bombardier Global family of business jets (5000, 6000, 7000, and 8000), electrical harnesses and electrical components for Bombardier business and commercial aircraft, and the forward fuselage and doors for the CSeries family of aircraft.

What are some of the key strengths that Querétaro offers as Bombardier’s base of its aerospace operations in México?

Before we made our decision to set operations in Querétaro, we evaluated several different locations around the world and we determined Mexico to be the best option because it is a country with very solid macroeconomic indicators for the future. It is part of the NAFTA agreement, and is within a similar time zone as our headquarters in Canada. It has a solid infrastructure, such as the dedicated aerospace park in Querétaro, a good road infrastructure; Querétaro’s international airport; and a vast industrial experience through the automotive industry. It also has an important pool of skilled human resources, and a strong commitment from the federal and state governments to develop an aerospace industry.

Can you talk about the work that you have done with universities and academic institutes to foster the local talent pool?

To date, Bombardier Aerostuctures and Engineering Services Mexico has nearly 1,200 full-time employees. In Bombardier we know that an industry as complex as the aerospace industry requires a solid team of workers, trained in the different areas of the processes we use to manufacture our products.

We think education is one of the three pillars that support the development of the aerospace industry, and for this reason we recognize the efforts done in the matter, such as the inauguration of the UNAQ in 2009, with the support of the Federal and State Governments, as well as the ITESM CE-DIA, in 2012. We currently have collaboration agreements with the UNAQ and the Universidad Tecnológica de San Juan del Río, to develop aerospace training programs. We also have collaboration agreements that include working internships, thesis projects, recruitment programs and job opportunities with the Universidad del Valle de México, the Instituto Politécnico Nacional, the Instituto Tecnológico de Querétaro, the Universidad Autónoma de Querétaro, and the ITESM.

How far away do you think we are from seeing whole aircraft assembled here and what challenges lie ahead in achieving this goal?

We do not have plans for assembling a complete aircraft in Mexico at this moment. However, any other of the international manufacturers present in Mexico will find the appropriate conditions to achieve this goal if it is part of their business plans. The Mexican aerospace industry has shown a continuous and increasing growth throughout the last years, which has strengthened all the components of the national aerospace supply chain.

What are the next major milestones that Bombardier hopes to achieve within its Mexico operations over the next five years?

On the next years, we will keep focused on strengthening our operations in the country within the new AERostuctures and Engi-neering Services business segment, which will enable us to further strengthen the Mexican aerospace industry. At Bombardier, we are proud of our partnership with the Mexican government in developing an industry that is attracting investments, highly qualified labor, technology and new expertise in many business sectors in addition to aerospace.
Can you give more details regarding the role and importance that each of these operations has for SAFRAN's global operations?

In terms of employment, SAFRAN Group in Mexico is a third after France and the United States. Therefore, Mexico represents a fundamental platform notably in aerospace regarding our proximity to the United States.

What advantages does the State of Querétaro offer to SAFRAN?

Chihuahua and Querétaro are both pro-business and are both good environments for investment. In terms of human capital development, the Aeronautical University of Querétaro has played a key role. For the development of the Franco-Mexican campus, we donated a CFM56 engine and two landing gear so students might work directly on these products to promote their technical formation.

We have an open dialogue with government officials in both states who express a lot of comprehension and willingness to support investment and businesses.

Can you elaborate on SAFRAN's efforts to grow and support the local supply chain?

Developing this local supply chain is a priority for us. We have put a lot of our efforts and human capital into a tool called the Franco-Mexican Strategic Counsel. We also have five factories in Querétaro, which started developing mid 2000s. Within the Safran family, we have Sncema, which produces motors for the CFM56 and will shortly produce LEAP engine parts. We then also have Messier-Bugatti-Dowty (MBD) who manufactures landing gear. Finally, we will round out our portfolio in Mexico with two maintainence, repair, and operations centers, one with MBD that does maintenance on landing brakes and one with Sncema that does maintenance on engines. As new factory of Sncema will be inaugurated in the coming months but is already in operation.

Other two subsidiaries also have an important presence in Mexico; those being Turbomeca, which provides customer support services to 250 helicopter engines in Mexico and Morpho, world leader in biometric systems and smart cards who has established contracts with the government, airports banks and telecommunication companies. There is also a lot of interest for SAGEM.

Can you provide some background on SAFRAN Group in Mexico, as well as the different companies operating in Mexico under the umbrella?

We have been operating in Mexico for 25 years when we started buying factories in Chihuahua which now fabricates plane ca bles for Boeing, Airbus, etc. Today we have more than 4,000 employees and five factories in Chihuahua with Local Power Systems. We also have five factories in Querétaro, which started developing mid 2000s. Within the Safran family, we have Sncema, which produces motors for the CFM56 and will shortly produce LEAP engine parts. We then also have Messier-Bugatti-Dowty (MBD) who manufactures landing gear. Finally, we will round out our portfolio in Mexico with two maintainence, repair, and operations centers, one with MBD that does maintenance on landing brakes and one with Sncema that does maintenance on engines. As new factory of Sncema will be inaugurated in the coming months but is already in operation.

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What are doing to support your human capital needs in Querétaro?

In partnership with Airbus Helicopters and the government we have created this Franco-Mexican campus in Querétaro, and we would like to develop a replica campus in Chihuahua but with the inclusion of broader scope of training.

We also have had success with our work study exchange program in partnership with the French-Mexican high school of Mexico City in which students receive a bachelor’s in aeronautics. We work with Mexican officials through Mexprotec to allow us to invite students in our factories and train them in France. This internationalization is an important factor in aerospace education.

What are SAFRAN’s next plans in Mexico?

We are in period of growth and Mexico is going to play an important part. For example, for the development of the upcoming LEAP engine, which will take over from CFM56. This will be commercialized in the coming two years, for which we already have all of the parts. Mexico will play a major part of this demand.

Do you have a final message for the international aerospace community?

Mexico is for us strategically important and we are experiencing very fast development. There is also a strong sense of confidence after 25 years present in Mexico and we have the intention to stay and continue our operations. There are three factors which define our reason for our continued commitment to Mexico: the presence of a strong skilled labor force, which is very involved in our operations; the federal and local governments, which are focused on creating a pro-business environment in which we can develop, and thirdly, geographically, we are at the door to one of the biggest markets in the world for aerospace.

At that time the company was called ITR and the main business was focused on repairs of J52ND engines. In 2000, ITR also started working on spares and general overhauling operations. The company started to manufacture small complex parts and, in 2006/2007, we moved to a different set of components manufactured for turbine engines. ITR also had an engineering division in which all of the operations were dedicated to turbine engines. In 2010, ITR acquired all of the company shares, and the company was then named ITP Engineering and Manufacturing.

ITP has three different businesses within the organization in Mexico. The first one is dedicated to tubings and the manufacturing of end fittings for the tubes. The second is an engineering, manufacturing and development facility. The third business under the ITP umbrella is involved in MRO activities on turbines and all their components, which includes the repair and overhaul services. The company has grown significantly over the years and currently ITP is also involved in the design of engine models.

Are the designs still exported to the United States and ITP's existing customers overseas?

ITP's design operations in Mexico are exported to Europe and to customers in North America, but there are relevant engine modules that we design and manufacture in our factory in Chihuahua. It is our desire to localize manufacturing capabilities of ITP are not for the Mexican market, as everything is marketed overseas to the place where Aircraft Engine Original Equipment Manufacturers have their facilities.

Can you elaborate on how ITP is developing the young talent in the area as to support your engineering and design needs?

Design operations in Mexico are relatively recent. It is clear that ITP has, and other companies are adding those capabilities. For the majority, staff is sourced from universities that send the students for internships where ITP will develop practical skills required for the industry. We also provide many internal courses in disciplines very specific for ITP utilizing the experience gained globally.

Does ITP play an active role in linkages and activities with academic institutions to ensure the curriculum is being geared towards the direction that the aerospace industry is taking?

Yes, ITP plays an active role, and I can give you an example of a general management topic that is on the counsel of UNAQ as an industry representative. Also, an important university that established in Querétaro came to 250 engineers focused on design and its programs and we responded accordingly. ITP has also funded employees in a master’s degree with a prestigious university linked to international professors. We also play an active role as members of the Aerocluster De Querétaro and participate with the research centers in different projects. Whenever it is possible, ITP provides feedback to the universities that send interns to our teams as to the real challenges for the programs to meet the demands of the markets.

There are significant gaps in the local supply chain in Querétaro. How does ITP’s business model operate in terms of outsourcing processes for your capabilities?

This is not an easy move but is part of the strategy. ITP continues to look for many capabilities that we have not yet been able to find in Querétaro or Mexico. Given that many processes are very specific, and ITP cannot have everything in-house and the gap with local supply exists, it is an opportunity. Certification of local suppliers to aerospace standards is one issue, but process capabilities and talented people are the challenges the local suppliers are facing.

This is so important for ITP that we have a department dedicated to developing the supply chain that has a wide technical knowledge and also of the local supply chain. ITP has robust processes and expertise in outsourcing processes for our capabilities. It is our desire to localize more volumes than we currently subcontract somewhere else in the world away from our factories.

What are some of ITP’s major goals over the next five years?

Commercial aerospace is ramping up and, as a global sector, Querétaro is linked to the same growth that most aerospace companies in the region are. ITP has the challenge to double its production in Mexico; the goal is then to optimize our processes. On the other hand, new products also evolve, we need to keep up with the tendencies and technological developments for future engines.
Jorge Gutiérrez de Velasco Rodríguez
President
AERONAUTICAL UNIVERSITY OF QUERÉTARO (UNAQ)

Can you please provide a history of UNAQ and any recent major milestones?

UNAQ and any recent major milestones? UNAQ was founded in 1905 as a technical institution but a university. This began analyzing the needs and the expectations of the market, taking into account the needs of the industry at that time. UNAQ continues adding new bachelor’s degrees, such as the two newest: aeronautics and computer science. The main focus is on creating a model that could be adapted to the specific circumstances of the country. UNAQ was founded in 1905 as a technical institution but a university. The faculty's profile in general is more technical or with hands-on experiences. The faculty's profile in general is more technical or with hands-on experiences. UNAQ was founded in 1905 as a technical institution but a university. Despite the close relationship with industries, UNAQ maintains a high standard of education, offering a wide range of programs focusing on theoretical and practical aspects. UNAQ was founded in 1905 as a technical institution but a university. Despite the close relationship with industries, UNAQ maintains a high standard of education, offering a wide range of programs focusing on theoretical and practical aspects.

Can you provide a brief overview of the joint venture between the two airlines that lead to TechOps Mexico being formed?

TechOps Mexico was formed as a result of the joint venture between Grupo Aeromexico and Delta Air Lines. The CEOs of both airlines collaborated to create a new MRO company, TechOps Mexico. This joint venture was established to take advantage of the strengths of both airlines, bringing together their resources and expertise to provide a high-quality MRO service. TechOps Mexico was designed to compete on a global scale, offering state-of-the-art facilities, equipment, and processes to meet the needs of the aerospace industry.

What key competitive advantages does TechOps offer over other MROs in the region?

TechOps offers a comprehensive range of services, focusing on maintaining and repairing aircraft to the highest standards. The company is equipped with state-of-the-art facilities and technology, ensuring that it can deliver superior results. TechOps offers a diverse range of services, from basic repairs to complex overhauls, catering to the needs of a wide range of customers, including airlines, OEMs, and independent operators. The company is committed to maintaining the safety and reliability of aircraft, ensuring that they meet the highest standards required by airworthiness authorities.

What challenges did you face establishing yourself as the largest MRO in Latin America and what solutions did you implement?

Challenges faced in establishing TechOps Mexico as a leader in Latin America include competition from established MRO companies, regulatory requirements, and the need to attract and retain qualified personnel. To overcome these challenges, TechOps Mexico focused on building a strong reputation for technical excellence, investing in state-of-the-art facilities and equipment, and fostering a culture of continuous improvement. The company also prioritized recruitment, training, and development of its workforce to ensure that it had the necessary skills to meet the demands of the aerospace industry.

Where are you focusing most to innovate?

TechOps Mexico is continuously innovating in various areas to stay ahead of the curve. Key innovation areas include developing new technologies for aircraft maintenance, improving processes for efficiency, and enhancing safety protocols. The company collaborates closely with suppliers, manufacturers, and other industry leaders to stay informed about the latest advancements and incorporate them into its operations. TechOps Mexico is also focused on sustainability, with initiatives to reduce its environmental impact and promote eco-friendly practices in its operations.

What are the most important lessons you have learned in the development of UNAQ?

The most important lessons learned in the development of UNAQ include the importance of aligning academic programs with industry needs, fostering a strong relationship with the industry, and prioritizing continuous improvement. UNAQ has cultivated a close relationship with the aerospace industry to ensure that its programs are relevant and up-to-date. The university actively seeks feedback from the industry to adjust its offerings and improve its teaching methods. UNAQ’s success is also attributed to its emphasis on quality education, strong partnerships, and the commitment of its faculty and staff to excellence in teaching and research.
There are many machining and electrical harness vendors, but there are gaps in Mexico's aero supply chain, e.g. heat treatment, special materials machining. To be efficient and cost effective, the home value chain has to be closed. There are 300 companies focused on aerospace in Mexico; the sector is growing at 18% year-over-year. To ensure a continued supply chain of talent, the Universidad Aeronautica en Querétraro (UNAQ) was established in 2007 to focus on technical development primarily to support Bombardier's electrical harness assembly. Master degree programs are offered in association with universities outside of Mexico.

How does GEIQ collaborate with universities in Mexico?

The company sends engineers to UNAQ to be exposed to aircraft and instruments to fully understand when writing the code for the end function of a device, i.e. navigation systems. GEIQ also has collaboration with the biggest university in Mexico—the Universidad Nacional Autonoma de Mexico, which has a master degree program in mechanical engineering. GEIQ also associates with Instituto Politecnico Nacional in Mexico, which accredits the company's internal classes as part of the university's master degree program.

What affect will the proposed construction in Querétraro of the National Center for the Research of Composite Materials have?

Laboratories have been lacking in Querétra- ro, and the center will be a great addition. Its function will be to develop and implement the work of Bombardier and others in composite materials; the center proposes to expand into other disciplines.

What are GEIQ’s focused areas in aviation and in what areas will it look to in- vest?

GEIQ has an engineering center in Queretaro to manage supplier relationships, but works directly with GE in the United States. The focus is on developing new aircraft; many suppliers are diversifying from the automotive industry into aerospace, but there is a difference in regulations between these two industries. Companies such as Bombardier are helping local vendors to develop and introducing vendors from outside Mexico; this will generate opportunities for tier-two and tier-three companies. It takes time to be recognized as a tier-one supplier.

Making the Riders Feel at Home

Building Querétaro’s Local Supply Chain

Top-heavy would best describe Querétaro’s aerospace sector today. It seems that the state has invited too many people to a party with too few drinks to go around. Though showing promising signs as the local emerging cluster, the state’s goal to develop a solid local supply chain has yet to be realized. Beyond the aforementioned obstacles in supply chain development, a significant challenge is the often vastly contrasting requirements of the prime contractors. While high quality is always expected, specific process requirements can differ. In Querétaro there is a greater need for suppliers of machining services. While certification is cited by many as a major challenge, some consider it not to be the only one. “Certification of local suppliers to aerospace standards is one issue, but process capabilities and talented people are the challenges that the local suppliers are facing,” said José Carlos Garcia, engineering and design director at ITP, Querétaro. ITP claimed that developing local suppliers is part of its strategy but is proving challenging. It is using its internal expertise and leveraging its knowledge of developing supply chains in other countries in which the group operates. There is certainly a willingness from the local small- and medium-sized enterprises (SMEs) to develop aerospace operations, but the consensus is that more support is needed. Despite original equipment manufacturers (OEMs) operating dedicated supply chain development teams, some Mexican companies feel that there needs to be more integration on the contractors part. HYRSA Aerospace is a family-owned, CNC-machining company that recently received its AS9100 certification and is currently in the process of obtaining customer approvals. “It is important for OEMs and tier-one companies to invest in suppliers in order to consolidate the local supply chain by offering training and assistance,” said Esteban Sanchez, the company’s operations manager. “With training and consulting services from experienced players, local suppliers will be able to break into the industry and reach the necessary level to become an aerospace company.”

It is important for OEMs and tier-one companies to invest in suppliers in order to consolidate the local supply chain by offering training and assistance. With training and consulting services from experienced players, local suppliers will be able to break into the industry and reach the necessary level to become an aerospace company.
What is your service offering to the aerospace industry? ETU’s facility opened in 2010; all equipment is new; has numerical control, and was purchased between 2010 and 2014. The company has a vertical turning lathe with a diameter capacity of 56; a Mazak 550 with a maximum machine capacity to 36, Mazak 350 and 450 for the smaller diameters, and a Mazak Nexus 510 installed at high pressure of 1,000 psi capable to deep drill on specialty metals, i.e. titanium and inconel.

What were some of the challenges when ETU changed its facility to expand into the aerospace industry? A main challenge was to fulfill its customers’ requirements, e.g. manufacturing quality control. A further challenge was the special processing required for a finished product, i.e. non-destructive testing (NDT) and heat treatment; currently, ETU still lacks heat treatment capability. Another challenge was to establish credibility; there have been serious competition between the culture of work in United States and Canada versus Mexico.

Do you have in-house secondary process capabilities? Within ETU’s facility, it has complementory processes for its core business turbine machinery, such as non-destructive testing (MPI & PP), HVOF, and plasma spray. As the company’s aerospace division manufactures an increasing range of mission critical parts, the capability of the company has increased to fulfill the needs of the aerospace industry.

How does ETU ensure quality? ETU has configuration management; this includes an installed in-process quality system plus risk management. Each request for a quote is received, a complete analysis and gap analysis of what is required to be carried out to achieve customer’s requirements. The company has in place key performance indicators, and has management revisions every quarter to follow up on them to improve company development; it also examines yearly feedback from customers about the company’s performance, assessing an average 85% to 90% qualification.

From where does ETU source its raw material and how does this affect on-time delivery? ETU has configuration management; this includes an installed in-process quality system plus risk management. Each request for a quote is received, a complete analysis and gap analysis of what is required to be carried out to achieve customer’s requirements. The company has in place key performance indicators, and has management revisions every quarter to follow up on them to improve company development; it also examines yearly feedback from customers about the company’s performance, assessing an average 85% to 90% qualification.

What is your service offering to the aerospace industry? ETU’s facility opened in 2010; all equipment is new; has numerical control, and was purchased between 2010 and 2014. The company has a vertical turning lathe with a diameter capacity of 56; a Mazak 550 with a maximum machine capacity to 36, Mazak 350 and 450 for the smaller diameters, and a Mazak Nexus 510 installed at high pressure of 1,000 psi capable to deep drill on specialty metals, i.e. titanium and inconel.

What were some of the challenges when ETU changed its facility to expand into the aerospace industry? A main challenge was to fulfill its customers’ requirements, e.g. manufacturing quality control. A further challenge was the special processing required for a finished product, i.e. non-destructive testing (NDT) and heat treatment; currently, ETU still lacks heat treatment capability. Another challenge was to establish credibility; there have been serious competition between the culture of work in United States and Canada versus Mexico.

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Could you provide an introduction to the company with a brief history and details of any recent major milestones? ETU has configuration management; this includes an installed in-process quality system plus risk management. Each request for a quote is received, a complete analysis and gap analysis of what is required to be carried out to achieve customer’s requirements. The company has in place key performance indicators, and has management revisions every quarter to follow up on them to improve company development; it also examines yearly feedback from customers about the company’s performance, assessing an average 85% to 90% qualification.

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What are some challenges and complexities of making that transition from your core industries to the aerospace industry? Currently 80% of our products are CNC lathes 20% are vertical, 4-axis machines. In general we have found that the aerospace complexity of making that transition from our business.

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What materials does HYRSA work with?
JS: Stainless steel is the main metal used in the food and beverage industry. HYRSA has several decades of experience in these industries and continues to employ a mix of 75% stainless steel for some products. HYRSA Aerospace has capabilities to work with specialty materials such as nickel alloys, titanium, and aluminum.

Have you encountered challenges sourcing specialty materials in Mexico?
JS: The challenge is finding local suppliers who sell small quantities at competitive prices. In aerospace, low volumes are the norm. Importing from the United States is an option when we have challenges sourcing locally. ES: When HYRSA imports raw materials, we lose competitiveness. However, the establishment of warehouses in the Querétaro Aerospace Cluster has started to alleviate these challenges.

What partnerships have you formed locally in order to establish a more efficient supply chain for special purposes?
JS: HYRSA works with companies in the Querétaro region to complete special processes required for its products. The arrival of new players to the Querétaro area has increased the availability of companies performing secondary processes such as heating-treatment and coating. This growing network of suppliers has, in turn, attracted additional players to come to the region. In the coming years, additional suppliers entering the aerospace business will solidify supply chains in Querétaro.

How does HYRSA utilize the academic institutions in Querétaro to acquire talent?
JS: HYRSA is the only company in its kind in Mexico. OEMs and other large players currently import many small parts required to produce turbines and other aerospace products. Therefore, we see potential for HYRSA to substitute some of the parts that original equipment manufacturers (OEMs) and tier-one companies import. JS: HYRSA’s machining capabilities cover high-precision small parts ranging from one quarter of an inch to six inches. Our products are used in the construction of turbines, hydraulics, and aerospace applications. ES: HYRSA mainly serves the Mexican market by supplying parts to OEMs that they previously had to import. However, we plan on expanding in the near future, particularly to the United States and Canada.

What materials does HYRSA manufacture?
ES: HYRSA Aerospace is the only company in Mexico that specializes in the production of aircraft components. We manufacture aircraft components that are used in the construction of turbines, hydraulics, and aerospace applications. ES: HYRSA Aerospace has capabilities to work with specialty materials such as nickel alloys, titanium, and aluminum.

Could you provide a brief introduction to TechFab?
TS: TechFab is a privately owned Canadian company founded in 1990 and specializes in the gun drilling, machining, and tooling of industrial components. With a strong focus on the aerospace industry, TechFab is able to offer turnkey solutions to our clients from design and conception, production, assembly and laser inspection. Furthermore, we work closely with our clients in design and conception of custom machinery.

What do you see as being the most important factor for the continued growth of Mexico’s aerospace industry?
ES: Several companies in Mexico already conduct conceptual design work and testing of their products. The industry has taken note of Mexico’s cost competitiveness in manufacturing. Now, it is moving to utilize the abundance of highly skilled engineers to gain a competitive advantage not only in manufacturing but also in design and innovation.

What do you see as being the most important factor for the continued growth of Mexico’s aerospace industry?
JS: Workforce mobility has increased with the arrival of new aerospace companies to the region. The supply of skilled labor has increased exponentially and, since the aerospace industry absorbs most graduates, the demand for skilled labor remains high.

In what ways has Mexico grown as a player in design and innovation in the global aerospace industry?
ES: Several companies in Mexico already conduct conceptual design work and testing of their products. The industry has taken note of Mexico’s cost competitiveness in manufacturing. Now, it is moving to utilize the abundance of highly skilled engineers to gain a competitive advantage not only in manufacturing but also in design and innovation.

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Having only been in Mexico since Febru-
ary, what was behind this decision and what is TechFab’s strategy in establishing itself as a key player in the country’s aerospace industry?
Having studied closely the evolution of this industry, TechFab identified the opportunities for small to medium-sized enterprises (SMEs) to support its supply chain. We saw that it was important for the continued development of the industry and for Mexico’s economy that there be a strong network of SMEs working within the aerospace sector. TechFab hopes to be a pioneer in achieving this. From our facil- ity in Querétaro, we are now able to offer all TechFab competencies in which we have 25 years of experience. We began the process of obtaining purchase orders three months ago. We hope to achieve a key strategic partner for aerospace companies operating in Mex- ico.

Do you see Mexico offering opportunities for pursuing a strategy of acquisitions? We certainly see potential for this. Our main goal is to establish a strong SME network within the aerospace industry. There are many companies that offer the services needed but they lack the certification or financial means to break into the aerospace market. Through a strategy of acquisition or simply sharing our knowledge and expertise with these companies, we will ensure reliable local suppliers are ready to meet the needs of the aerospace industry in this coun- try. The local and federal governments here are very active and supportive when it comes to funding, which is extremely beneficial to the industry as a whole. TechFab shares the main goal of ensuring the Mexican industry is fully utilized by the aerospace industry.

Where does TechFab hope to be in five years in terms of market positioning and service offerings?
We estimate that our entire work force will have expanded to 100 people in five years. We see the potential for this in Mexico, so we are hopeful that our efforts will continue our vision. In terms of technical expertise, we will continue to engage in single-part manufacturing and build on the applications of our products. The market for our product and service offering in Mexico is large, there- fore there is plenty of potential and scope for growth.

Do you have a final message for readers?
Mexico is a vast country with a large, ex- tremely talented young population. It is a stable environment for our business, and the economy is growing. Finally, Mexico offers a talent in the aerospace and engineering fields. These factors make Mexico a viable place for investment and manufacturing in the aerospace industry.

Mexico, and in particular Querétaro, has great potential to not only manufacture aircraft components, but also to be involved in the design. A key factor in achieving this is education. We are working closely with the academic institutes here to establish effective training programs that will ensure a deep talent pool of qualified personnel available to serve the human resources needs of the aerospace industry. Our eventual goal is to no longer be dependent on our counterpart in Montreal for human resources. Pursuing the design facet of this industry will not only give TechFab a competitive edge among other similar companies, but will also con- siderably strengthen Mexico’s reputation as a popular destination for the aerospace com- munity.

What do you see as being the most important factor for the continued growth of Mexico’s aerospace industry?
TS: Several companies in Mexico already conduct conceptual design work and testing of their products. The industry has taken note of Mexico’s cost competitiveness in manufacturing. Now, it is moving to utilize the abundance of highly skilled engineers to gain a competitive advantage not only in manufacturing but also in design and innovation.
Can you provide some background on Grupo TTT?

Grupo TTT is a Spanish company with over 50 years experience in the field of heat treatment. We have been working in the aerospace industry for more than 30 years, and today 35% of our total business is focused on this sector. We have four facilities in the Basque Country that offer a total of 23 different special processes, all of which are NADCAP-certified. All laboratory processes that we have supporting our operations there are also NADCAP-approved. Each facility is dedicated to different special processes, particularly in Querétaro. After the decision was taken to migrate to Mexico, we embarked on a thorough exploration of the market to seek out what we would be able to bring to the table. The most important part for us to address first was ensuring that we had sufficient power to run our furnaces, which all run on electricity. This facility was completed in 2014, and Aeroprocess TTT began operations in May 2015. Since we arrived without a contract from an existing partner, we have been focused mostly on establishing ourselves as the partner of choice for all companies needing heat-treatment services in Querétaro.

What are you doing to address your most important need in Mexico, which is about 25%, but a figure we are looking to grow.

How important is heat treatment to the supply chain of a metal component?

Heat treatment and other special processes come last in the supply chain for a metal component and are the most important. The processes are designed to increase the hardness and resistance of a metal that is able to stand up to extreme conditions.

What steps are you taking to ensure quality and on-time delivery?

To work in the aerospace sector, certification is essential and we have our AS9100 certifications. This means that essential customers will be able to use us as a supplier. Gaining certification is a rigorous process; every detail must be closely monitored from the time a furnace is built to what you expect the laboratory test results to show.

Do you have a final message?

Aeroprocess TTT wants to invest in more technologies, depending on the demand of the market and customers’ needs. The aerospace sector is growing up to fast, and we want to be here and help on that. In August of 2016 we are going to have the NADCAP audit, which will help us gain more work. Having a company that does special processes in Querétaro will make it easier to develop a complete supply chain in the area and in Mexico.

CEO visited Mexico and noted how the state of the aerospace industry was very similar to what it had been in the Basque Country 25 years ago and what was lacking very much was the opportunity and would be most in deciding which market would offer us the most. After the decision was taken to migrate to Mexico, we embarked on a thorough exploration of the market to seek out what we would be able to bring to the table. The most important part for us to address first was ensuring that we had sufficient power to run our furnaces, which all run on electricity. This facility was completed in 2014, and Aeroprocess TTT began operations in May 2015.
In a quality-driven industry, there is considerable emphasis on testing and quality control. Testing can often be a highly specialized and particular process, which companies seek to outsource. Nonetheless, more companies, both local and international, are looking for these services, which greatly increases costs, and lead-times. In a quality-driven industry, there is considerable emphasis on testing and quality control. Testing can often be a highly specialized and particular process, which companies seek to outsource. Nonetheless, more companies, both local and international, are looking for these services, which greatly increases costs, and lead-times.

Grupo Forem has already been able to expand its service offer rather than simply adjusting our model to meet the requirements. “However, we saw it as a challenge for us,” said Fausto Yépez, deputy director general of Grupo Forem. “Obtaining NADCAP accreditation was certainly a complex technical test for our clients. We noticed manufacturing companies offered free design services if a customer decides to buy the final manufactured product as a key turn project. Therefore, CEAT experimented with this business model (turnkey projects) to offer competitive services and address the low demand for stand-alone design services. What projects demonstrate the company’s capabilities? MSR: Técnica Test-CEAT helped Sigma Aerospace establish a design center and train new engineers. Our company embarked on a one-month training to fast-track the specialization of our engineers for work in the aerospace industry. We offer several courses including finite element and fluid analysis. In 2010, CEAT did a joint venture with Técnica Test. We noticed manufacturing companies offered free design services if a customer decides to buy the final manufactured product as a key turn project. Therefore, CEAT experimented with this business model (turnkey projects) to offer competitive services and address the low demand for stand-alone design services.

Could you provide an overview of Técnica Test-CEAT’s non-destructive testing (NDT) services? MSR: Técnica Test began offering non-destructive testing (NDT) services in 1993 and has expanded to become one of the few Mexican companies to offer dimensional metrology, magnetic particle and ultrasonic inspection, coordinate measuring, eddy-current inspection, and microscope equipment, among others. CEAT was founded as a design center and has been working with major companies such as SAFRAN, Bombardier, Exova, and test solutions. The new plant will also house a lab specializing on application development and expansion to become a provider of complex technical tests for our clients. Today, companies ask for mechanics and automate their processes, in order to automatically inspect a product and identify cracks or other faults. Do you have a final message for the readers of this publication? IS: Many clients prefer single-supplier contracts for the provision of an entire solution, and this new plant. Técnica Test seeks to consolidate our clients’ supply chain. What services does Técnica Test-CEAT offer to achieve cost reductions for clients? MSR: Técnica Test assists companies with the introduction of enhanced automation capabilities to reduce testing costs. Técnica Test’s non-destructive testing equipment can be used for testing in production lines. Today, companies ask for mechanics and integration capabilities from their suppliers. Accordingly, the addition of CEAT allows our company to offer a complete solution that can be integrated into our customer’s system.

How has research and development (R&D) grown in Mexico and how is Técnica Test contributing? MSR: Companies are aware of Mexico’s cost-competitive advantages. Today, however, companies are eager to relocate R&D projects to Mexico and utilize the growing talent pool of engineers. The addition of CEAT at Técnica Test demonstrates our belief in the future for Mexican innovation and research. MSR: Today, Técnica Test-CEAT engages in reverse engineering and conducts research and development. We have some of the best talent in the industry and access to special technologies such as laser scanners. Our staff is able to conduct research and develop processes. The systems that Técnica Test-CEAT produces have the ability to eliminate manual tasks and hard work. As with our decision to open a new plant, Mexicans seek to fully realize their goals. Técnica Test-CEAT plans on taking advantage of our established connections with other players to grow within the aerospace industry.

Testing and Quality-Control Services in Querétaro

In Querétaro, there is considerable emphasis on testing and quality control. Testing can often be a highly specialized and particular process, which companies seek to outsource. Nonetheless, more companies, both local and international, are looking for these services, which greatly increases costs, and lead-times.
Leonardo Romero

Senior Sales Manager
HELMUT FISCHER, S. DE R.L. DE C.V.

Could you provide an introduction to the company and a brief overview of Helmut Fischer’s move into Mexico?

Helmut Fischer offers a broad range of measuring and analysis instruments for the most diverse applications and industries, and our products have been used in Mexico for a long time. It was in 2012 that we established a permanent office here in Querétaro in response to a growing demand for a number of our product lines. Since then, we have been very active in raising our profile amongst companies here and have steadily gained recognition from a number of large businesses. Our name has lent us a significant advantage in assuring our clients of the highest standard of service with full certification. Though currently accounting for 25% of our business in Mexico, we view the country’s aerospace industry as being a key area of growth for our operations.

What products does Helmut Fischer offer and where in the supply chain do you fit in?

Helmut Fischer products are an integral part of any form of supply chain do you fit in? Helmut Fischer offers a broad range of measuring and analysis instruments for the most diverse applications and industries, and our products have been used in Mexico for a long time. It was in 2012 that we established a permanent office here in Querétaro in response to a growing demand for a number of our product lines. Since then, we have been very active in raising our profile amongst companies here and have steadily gained recognition from a number of large businesses. Our name has lent us a significant advantage in assuring our clients of the highest standard of service with full certification. Though currently accounting for 25% of our business in Mexico, we view the country’s aerospace industry as being a key area of growth for our operations.

Can you provide a case study or example that demonstrates your role in implementing the services that you provide to a company?

We were recently requested to conduct measurements on titanium hydraulic components. For this we carried out an imparallel microscopy analysis in a third party laboratory. The client had asked that we use our X-ray fluorescence (XRF) method, as this is a non-destructive examination for a faster evaluation of the coating thickness. We ended up incorporating our XRF product into the client’s company laboratory in order to run the test. Another example is a project that we carried out with a large American company, which requested a hardness evaluation without marking the component. For this, we use a nano-indentation instrument, which is able to measure the hardness of a material in a tiny area.

Why was the State of Querétaro chosen as a base for Mexican operations?

One of the main reasons for Fischer to locate itself in Querétaro was security. The state offers one of the highest qualities of life in the country. Another reason is proximity to other companies in the aerospace and automotive industries. The geographic location of Querétaro is also beneficial as we can make day trips to Guadalajara, Mexico City, and many other places from here for work purposes.

Have you noticed a stronger emphasis on innovation and research and development (R&D) in Querétaro?

Yes, it is interesting because there have been many research centers in Querétaro for a long time. Within the aerospace sector, there has been a boom coming not only from government institutions but also from private companies. Fischer just joined an association for surface finishing, and we have been partaking in the conventions and lessons for the expertise and technique of operations for this. People from research institutions are also coming and speaking to the association in order to provide education on certain topics, so there is certainly a trend towards R&D in Querétaro.

What must local companies address in order to succeed in Mexico’s growing aerospace industry?

Certification is crucial. Currently the AS9000 certificate is barely known in Mexico. I was able to attend a speech by someone from SGS, which has the certification to provide an audit on AS9000, and there were very few companies mentioned that are behind this. There is a large scope for businesses to get certified on AS9000, and while it would be a challenge financially to get involved and accredited, it would also lead to massive gains for the company. The level of qualification needs to grow in Mexico, and this is in the process of happening. I believe that it is possible that this will be achieved in the next few years.

Where will Helmut Fischer be in five years?

I hope that we can begin manufacturing in Mexico of our complex instruments, in addition to offering full service on laboratory testing and quality checks. With regards to manufacturing, we are aiming to initially start doing the final assembly of components in addition to selling more complex solutions that we are working on. We are also beginning to work with non-destructive radiative measurements, and we have a few customers lined up for this product. We will be training our staff to handle isotopes and the equipment for radioactive material testing. I am excited about the discoveries we will make here in Mexico, and my expectation is that we will find opportunities to grow and develop in the coming years.
Nicolas Fournier & Rubén García

Please provide an introduction to NDT EXPERT Mexico?
NDT Expert Mexico is a subsidiary of the Testia Group, which is based in Europe. The company was incorporated here in 2011 and is focused on providing a range of services in the field of non-destructive testing (NDT). The reason behind our move to Mexico was its focused on aero space NDT services in the country and so we established ourselves here to address that gap.

Can you provide details about the facilities, equipment and certifications that you have supporting your operations in Querétaro?
NDT is a very specialized service and can have serious repercussions if not carried out correctly. As such, trust is the most important aspect of any partnership in this field. The largest challenge for us has been to overcome this and assure our partners of our capabilities and the quality we offer. We have worked hard and leveraged our reputation in Europe to achieve this. Now that we have a strong customer base, we are seeing more in the way of recommendations. We have managed to gain a strong reputation and our market is growing.

How have you seen the aerospace industry in Mexico evolve since its beginnings?
RG-1 first began working in aerospace in 2000 when there was only one international player with a presence in Mexico. At that time, no one could have predicted the growth that this sector has seen over the past 15 years. The country now boasts a solid local supply chain and companies are focused on quality and achieving the highest standards. Here at NDT EXPERT Mexico we have had not a single NCR or non-conformity. We are well on the way to achieving our goal.

Do you have a final message for our GBR readers?
We have reached this goal we will begin to look to other parts of Latin America to offer our services.

Gene Morrison

Can you provide a brief history of Intertek’s operations in the Mexican aerospace industry?
Intertek has been operational in Mexico for 12 years now and started initially in the commercial sector. Seven years ago, it began servicing the country’s aerospace industry. The sector is incredibly active and vibrant and has grown rapidly over the past decade. We expect to see significant exponential growth in the future.

What services do you offer?
Intertek offers a range of services in the aerospace industry. These include: inspection, training, consulting and certification services.

How do you leverage your global capabilities to ensure companies in Mexico are receiving a value-added service?
Intertek is a global company with a strong focus on Querétaro and have recently hired a local auditor to reduce costs for our customers in the state.

What role does Intertek play in fostering the growth of the local aerospace supply chain in Mexico?
Intertek’s role is to help companies in the aerospace supply chain in Mexico achieve the highest quality standards.

To what extent does Intertek remain a strategic partner for a company to solve a problem for themselves?
Intertek is constantly thinking of the future and the services that we can offer companies post certification. Following a successful audit we will return once or twice a year to not only confirm that the practices are still meeting the standard’s requirements, but also to assess whether the quality management system is truly helping a customer achieve their strategic goals. In addition to this we can provide a number of other services such as training services and second-party supplier audits.

Do you have a final message?
Intertek anticipates a lot of growth in Mexico’s aerospace sector. This is an industry and sector that we are extremely excited about. We have several large strategic customers, each with their own supplier base, which will considerably help us grow our market. I would stress that Mexico is no longer just a cost-competitive location. The extremely reliable and willing labor force is a huge credit to the country and is launching Mexico on to the global stage as a promising player in the international aerospace industry.
“Guaymas is a very enchanting place, which at times may be ineffable. It is once businessmen come that they really get a sense of a workforce that has industrial roots, being an area that has been focused on industry for quite a while which is a hidden gem. Whatever investments a company may make to train people; that investment is more protected here because people tend to stay. Guaymas is a niche for high-tech machining companies and it has been our job to put this city on the map, and we believe that we have done that.”

- Eduardo R. Saavedra, Executive Vice President, Business Development, The Offshore Group
Aerospace in Mexico

Sonora Powers
Aerospace in Mexico

What would the Mexican aerospace industry be without the Sonora cluster? This is akin to asking what an aircraft would be without its engine. The Sonora aerospace cluster, largely divided between Hermosillo, the capital, and Guaymas and Empalme, neighboring cities to the south of Hermosillo, is filled with companies focused on precision machining or electromechanical assembly, while others utilize highly sophisticated processes to change the physical properties of metal through heat-treating processes or other procedures. This combination of capabilities makes Sonora the largest cluster of precision-machining and engine-component companies in Mexico, serving major players such as Rolls-Royce, GE, Siemens, Honeywell, and Pratt and Whitney.

### Operational Benefits of Sonora

Sonora is traditionally a mining state, but it has been recruiting foreign players to work in its aerospace sector. Apart from the pro-business government that has been going the extra mile to attract foreign companies by, for example, establishing training centers such as the Sonora Institute for Aerospace and Advanced Manufacturing (SIAMM) in Hermosillo, the state has many intrinsic advantages to offer.

A key competitive factor that Sonora enjoys is its excellent logistics and technology pipeline thanks to its proximity to the United States, specifically the Phoenix region. “Phoenix is a pretty active area where there are always aerospace summits and seminars. Honeywell is there, and it loves the fact that we have an engineering and service center in Chandler, while still manufacturing in Sonora,” said Charlie Hess, president and CEO of St. Clair Technologies. “Guaymas is a great launching pad, as there are a number of highly experienced people and companies that are doing aerospace-type business [. . .] Though operating in Guaymas we are able to find qualified talent with previous experience, as well as being able to supply to major players both in Tucson and Phoenix.”

While location is a key consideration, regardless of whether companies are operating in a booming industry or not, cost is still king, and Mexico has long been known for helping companies achieve cost-efficiency gains. “Cost is a big factor. We have to be creative in finding ways to cut costs, and Mexico is one of the ingredients. It is not everything, but it has been an important factor. We have been very creative in challenging the design of some of our products, but it comes to a point where we have to find the best-cost area, which, please keep in mind, is very different from a low-cost area,” emphasized Bruno Ferrand, president and CEO of Latecoere International. “Best-cost areas mean the best location, talent, and eagerness to succeed, while a low-cost area immediately triggers a negative perception.”

One important way that Sonora allows companies to achieve cost gains is by having a stable workforce. Speaking to Minco Manufacturing’s Demiller Affiliate’s operations in Empalme, Rafael Galgado, president of the company, noted, “There is a very competitive workforce in the area. The turnover of operating in Empalme in comparison to Tijuana or Nogales is less than 1%, while absenteeism is around 1.5%. The Empalme facilities have the benefit of developing local personnel that usually do not want to leave, as they see they have the opportunity to develop their career by staying with their companies.”

Another great benefit that many aerospace companies enjoy is that many customers are quite literally next door in the aerospace-engine hub in the cities of Guaymas and Empalme, located a short 10-minute drive apart, created in large part thanks to the efforts of The Offshore Group shelter. In this area, 15 out of 40 clients within the shelter are spread over three industrial parks. The Offshore Group has been instrumental in the development of the aerospace industry not only in Mexico, but specifically in Guaymas.

“In less than 60 days, St. Clair Technologies was fully operational and when running a business, the old adage of ‘time is money’ is true,” said Hess of St. Clair Technologies. “The Offshore Group,” he continued, “was a strategic partner from the very beginning. Its team has the expertise to bring in a business, get it set up, employ correctly trained personnel and let the company focus on its core competence. So the hiring of the people and the acquisition of the bricks were all managed for us. It is extremely beneficial to a smaller-sized, privately-held company. It really makes a difference for me as president and CEO not to have to worry about the peripheral issues.”

### Logistics Challenges

Though companies operating in Sonora are positive overall regarding the region’s attributes, no location is devoid of challenges.Southern California shipments to cross and arrive in Guaymas within two days of shipment date.”

Latecoere, on the other hand, brought one of its longtime partners to Mexico, which is conveniently located across the street, allowing the company to receive the necessary components in short time. Ferrand explained that, “As this industry picks up speed, we will have to strengthen our relationship with our suppliers in order to ensure outstanding performances control. [. . .] This is the ‘Extended Enterprise’ concept. Once we use this technique to get a price-effective product, we will therefore be able to acquire more business and customers by being more cost-effective.”

A Bright Future Ahead

While the cluster is still in its early stages, companies are betting heavily on Sonora by making serious investments and bringing innovative solutions to Mexico. A case in point is the work being done by Ellison Surface Technologies, which is commercializing a unique set of processes to the country. As Mexican companies want to grow, produce, and process their goods solely from within the country, Ellison Surface Technologies is helping them to do so at the Guaymas site by providing thermal spray, dry-film lubricant, VPA (vapor-phase aluminizing), heat treatment and brazing, full metallurgical laboratory and FPI locally so that companies operating in Mexico can concentrate their operations in Mexico. “These are not new technologies to the industry, but they are new to Mexico, which is a game-changer in the Mexico aerospace community,” stated Eric Delby, director of sales and marketing. “Because of the technologies we have introduced, the industrial park offers aero engine original equipment manufacturers something that is not available in other regions of the world: a complete supply chain from raw material to finished part, all in one location.”

Latecoere is also innovating in Mexico, but through experimenting with a new operational plant model. Octavio Baro, general manager of Latecoere Mexico, explained, “If you were to ask us what the future looks like for manufacturing in the aerospace industry, the model that we are operating under in Mexico is what it will look like. The plant manager is in charge of two different divisions. Instead of a plant focusing on hussenses or solely on doors, our plant has a number of different foci. It is an honor to be here in Mexico where this has been able to become a successful reality.”

Seeing a country absorb a new industry is rare. Even more rare is the pace at which this is being done in Mexico and Sonora. The aerospace industry wholeheartedly believes Mexico is doing an excellent job, especially in Guaymas, the engine cluster. “The future is very bright for aerospace manufacturing in Sonora,” concluded Cappelli. “For companies that have well engineered products and well automated processes, Mexico provides a great opportunity to become more competitive and provide greater value to their customers and stakeholders.”

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What are the key strengths that you see in Mexico as a hub for the aerospace industry?

MJS: The Sonora Economic Development team is very knowledgeable, proactive, and dynamic. The State of Sonora has been labeled the gas-turbine engines capital and although that is not its specialty, it does highlight the capabilities in the region.

What are the next major milestones The Offshore Group hopes to achieve in the next five years?

ERS: The Offshore Group wants to establish a strong presence in Queretaro and offer its services to companies looking to enter the Mexican aerospace industry. We will continue to offer the most tailored solutions so that our clients can focus on their product and have successful and sustainable operations in Mexico.

What are some additional tangible benefits for companies to collaborate with The Offshore Group that you would like to draw attention to?

ERS: The Offshore Group has a substantial amount of services at its disposal. Among these is what we refer to as ‘global partnership’, the idea that we are not a target—or at least not an easy target. The Offshore Group works closely with U.S. Customs and Border Protection to learn from them and teach them what we have learned so that we are not a target—or at least not an easy target.

Where will most of the growth come from in the short-to-medium term?

ERS: Most of the growth that we have seen is coming from existing clients. As they win customers, they are able to continue growing. Clients of the Offshore Group are actually reporting that they need more buildings or more people. With regards to the newcomer companies, their growth has been steady but relatively slow.

Have you seen the lack of OEMs as a factor that limits the success of the cluster?

ERS: Right now there are no OEMs present in Guaymas, and engine OEMs are not making complete engines here. As of now, there are no plans to bring a full assembly-operation to Mexico, so when done correctly that can limit the success of the cluster. Imagine if GE were assembling entire engines in Mexico. It would draw in even more levels of that supply chain into the country. Aerospace is a different industry in that it is cautious, very slow-moving. It takes time for a company to reach the marketplace. There is a backlog of thousands of planes that need to be made, only build a few of them every year, so the development of airplane assembly plants in Mexico seems like the clear natural step, but it is not being taken nor there seems to be an intention to do so.

Could you tell us a little about the university that The Offshore group is establishing?

ERS: There is not a university per se that is ours. There are many universities that work as technical trade schools that are making their way into the industry by preparing people with necessary skills. What The Offshore Group has done is found a training center full of machines and have carried out various training courses. They have been successful at providing targeted training for specific companies. What perhaps is on the horizon is doing more massive training seminars for an entire labor force. It can take up to 2,400 hours of training to operate some of these machines. Doing more of these kinds of training seminars would distinguish us from other regions.

How would you evaluate the region of Guaymas in regards to safety in comparison to the locations of the other four aerospace clusters?

ERS: The population in Guaymas is around 200,000 people, which makes it considerably smaller than the other cluster locations, a factor that definitely helps with the security situation. Safety, on the business side, however, is always part of the equation. We have secure access to our plants and constant surveillance and sophisticated cameras. Most people on the outside know that there are enough checks and balances that they would rather commit a crime somewhere else. Additionally, The Offshore Group works closely with U.S. Customs and Border Protection to learn from them and teach them what we have learned so that we are not a target—or at least not an easy target.

Where would you see the region of Guaymas as being? Industry Explorations

ERS: Guaymas is a very interesting place, which at times may be inhospitable. It is once businesses come that they really get a sense of a workforce that has industrial roots, being an area that has been focused on industry for quite a while which is a hidden gem. What perhaps is on the horizon is doing more massive training seminars for an entire labor force. It can take up to 2,400 hours of training to operate some of these machines. Doing more of these kinds of training seminars would distinguish us from other regions.

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What opportunities did you see in opening a facility in Guaymas that would allow you to better serve your clients? What enabled you to do this?

While there are clear advantages to working in Guaymas as you mentioned, what are some of the challenges that Ducommun faces?

For companies that have well engineered products and standardized processes, Mexico provides a great opportunity to become more competitive and provide greater value to their customers and stakeholders. The future is very bright for aerospace manufacturing in Sonora. Thus far, it has been a great experience for Ducommun.

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Please provide a final message for GBR’s readers, the international aerospace community.

The facility in Guaymas was established in 2007 and was specifically developed to allow Ducommun to gain a competitive edge in the global aerospace market. Our facility provides lower total cost labor for Ducommun’s business units; including post-machining, painting, and final assembly.

The facility has gained a good reputation for the quality and on-time delivery performance that has been sustained over the last several years. Our Guaymas facility has maintained a five-year, 100% quality and on-time delivery for a major customer, which has led to the awarding of a long-term contract.

room for improvement. St. Clair Technologies is trying to penetrate the market through innovative solutions and products. To give an example, there are harnesses and wires that are assembled by hand, with potential for human error in the cockpit of an airplane that have the same temperature rating of 175°C as the harnesses on the engine. Imagine what could be hapenning if an airplane's cockpit was undergoing 175°C phenomenon as the protocol states—it does not happen, whereas a harness in the cockpit is built with a 100°C rating, it could change things on a weight and cost perspective for the manufacturer. For the aviation industry, if some weight can be removed from the harness, it becomes more interesting from an attractive sales cost because the fuel saving over its lifecycle is exponential.

How has operating in Guaymas helped you develop in the aerospace industry? Sonora represents an excellent pipeline of great proximity to the Phoenix region, which is where St. Clair Technologies is focusing its marketing efforts given. Phoenix is an active area with many aerospace summits and seminars. Howewell is there, and it loves the fact that we have an engineering and service centers in Chandler, while still manufacturing in Guaymas, Sonora, Mexico. Guaymas is an aerospace country, with no one else in the world, with a large variety of aerospace suppliers.

St. Clair Technologies was fully operational in 1996 and shipped its first part in the late 1990s. St. Clair Technologies is a business in which we have one foot in the door, we are confident that it will be a successful business.

Small companies like St. Clair Technologies have to take full advantage of all the available opportunities and be able to tell them apart: the same connectors and wires are assembled by hand, with potential for human error in the cockpit of an airplane that have the same temperature rating of 175°C as the harnesses on the engine. Imagine what could be happening if an airplane's cockpit was undergoing 175°C phenomenon as the protocol states—it does not happen, whereas a harness in the cockpit is built with a 100°C rating, it could change things on a weight and cost perspective for the manufacturer. For the aviation industry, if some weight can be removed from the harness, it becomes more interesting from an attractive sales cost because the fuel saving over its lifecycle is exponential.

In the automotive, truck, and bus markets one can obtain new connections fairly quickly, while the aerospace industry moves much slower. Aerospace requires a very different relationship to advance the connection. The aerospace product is a multi-year commitment. That was one of the key factors in our decision to choose Sonora.

What have you experienced with the Offshore Group? How has the Offshore Group helped you with your business in Guaymas?

We have become known. We have maintained a five-year, 100% quality consistent performance. The facility has gained a good reputation for its hard-working and dedicated people. That was one of the key factors in the selection of Guaymas as our offshore manufacturing site. As a result of the selection of Guaymas, we have experienced a less-than-2%, year-over-year, personnel-turnover rate, which has been of great benefit to our consistent quality of product.

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Could you explain more about the technology that Ellison has developed that has never been seen before in Mexico? ED: Ellison is concentrating on a unique set of processes in our Guaymas, Mexico facility. The site already has in place thermal spray, dry-film lubricant, vapor phase aluminizing, heat treatment and brazing, full metallurgical laboratory and FPI. Additional processes are being considered based on market demands. These are not new technologies to the industry, but they are new to Mexico, which is a game-changer in the Mexico aerospace community. We are pleased to be located in the Roça Fuerte Industrial Park in Guaymas, a constantly growing center for aerospace manufacturing. Because of the technologies we have introduced, the industrial park offers aero engine original equipment manufacturers (OEMs) something not available in other regions of the world – a complete supply chain from raw material to finished part, all in one location.

How is Mexico adapting to the new processes and technologies that are now available? EP: We are extremely happy with the enthusiasm and efforts from the partnerships that we have developed in Mexico. The local state and federal leaderships understand the value of our capabilities and have been very supportive. In addition, we were pleased to find a highly skilled labor force. In every aspect, Mexican workers have exceeded our expectations and have excelled through the training process and achieved approval as certified operators. We are pleased to be investing in the growth of the local community through offering technical jobs. The goal now is to work in conjunction with the government of Sonora to ensure that the state is continually improving the labor force and manufacturing technology, ultimately elevating Mexico’s ability to compete globally.

Looking towards the future, where do you expect the main source of growth to come from? EP: In Guaymas, there are a broad mix of companies originating from within Mexico, the United States, and Europe. The presence of special-process capabilities is changing the dynamic of the aerospace industry and how global organizations view the prospects of doing business in Mexico.

Most organizations in the region dedicate themselves to much machining and source further processing or treatments to the United States. Ellison Surface Technologies is providing the coating and treatment processes in country, which is drastically reducing the supply chain lifecycle. This will enable steady growth, as we bring the space backlogs put greater emphasis on reduced lead times.

Traditionally, components coming from Mexico for processing will cover thousands of miles over many weeks to go through post-processing, coating, and finishing. The real value in Ellison’s operation in Mexico is the impact on turn time and delivery. We are there because the industry demands speed, so locators proverbial customers is critical. We have seen the impact of this model in our U.S. and Canadian facilities as well. In Mexico, what used to take 10 to 12 weeks can now be achieved in two weeks or fewer by bringing multiple processes under one roof and close to our customers. This allows for a significant paradigm shift in sourcing strategy.

What are your key priorities and strategic plans for the next three-to-five years? ED: Ellison is currently focused on a series of new product introductions with key relationships. These projects represent a number of different platforms in our business. Our facility in Guaymas, Mexico offers a significant opportunity for diversification of business both within the operation and across the organization. As the supply chain matures, many organizations across multiple industries will leverage the value and expertise of Mexico’s aerospace and power-generation platforms. Our facility in Guaymas, Mexico is focused on manufacturing and coating and treatment processes in country, which is drastically reducing the supply chain lifecycle. This will enable steady growth, as we bring the space backlogs put greater emphasis on reduced lead times.

Can you give a brief introduction to Latecoere and your operations in Mexico? BF: In 2017, Latecoere will be celebrating the 100th anniversary of its founding. We are made up of 5,000 people who are dedicated to three divisions: aerostructures, connecting systems (wire bundles, electronic bays and video systems), and services (engineering and tooling). Latecoere is not only a manufacturer, but functions as a design + manufacturing company. The operation in Mexico is the only location in the world where Latecoere operates two divisions at one location, under the same roof, with a single management team.

Why did Latecoere choose Mexico as a location? BF: Cost is a big factor. We have to be creative in finding ways to cut costs, and Mexico is one of the ingredients, but it is not everything. We have been very creative in challenging the design of some of our products, but there comes a point where we have to find the best-cost area, which is very different than a low-cost area. Best-cost areas mean the best location, talent, and eagerness to succeed, while a low-cost area will enable steady growth, as we bring the space backlogs put greater emphasis on reduced lead times.

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Locals say 'we defeated the desert', and it is true, the climate has forged these strong businessmen; the environment has not given any other choice. They are always over-achieving.

- Martha Elvia Meza Meléndez, Director, ProMéxico Coahuila
IMMENSE POTENTIAL
La Laguna’s Pioneering Aerospace Cluster

Among the fastest growing conurbations in Mexico, the northern-central region of La Laguna has a footprint that crosses both Coahuila and Durango states. The three cities that comprise the majority of its contents are Torreón, Gómez Palacio, and Lerdo, which combined boast a population of just over 1 million. Though aerospace has not yet solidified a renowned presence in La Laguna, there are a handful of local, dedicated companies that are working to break into the industry and fill some of the many gaps in the supply chain. The impressiveness of La Laguna lies in how successful these entities have become without the boost of foreign funding. All but one member of the newly forming aerospace cluster represents a trans-generational, family-owned company. This concentration of locally grown businesses that are in tune with the national industry roadmap cannot be found in any other part of Mexico. Most of them have evolved from owning a single machine into becoming a supplier for world-class companies across industries, including agricultural, energy, medical devices, and more. Concrete steps have already been taken in regards to the aerospace transition, as most members have or will obtain their AS9100 certification in 2016. The desire to be involved in aerospace specifically responds to a targeted push from government, with support and guidance being provided accordingly. “I have very high expectations of what succeeds the La Laguna region can achieve if all private sector entities and the government collaborate with the common goal of developing the aerospace industry further,” noted Alfonso Cabello Guerrerro, business developer and vice president of ACV Group, a family-owned company established 46 years ago that is focused on value-added processes for various metals and is specialized in welding.

High expectations directly correlate with the growth and expansion plans for these companies. Kirytymex is extending its plant by 3,000 square meters to add a machining center; Kimball Solutions has a brand new testing and inspection laboratory; Intelligent Sourcing Solutions plans to add four- and five-axis machines and a metrology laboratory to its repertoire. These expansions are all in preparation for aerospace client development. “International B&S has been preparing its operations and employees for the aerospace sector for over two years so as to go above and beyond requirements,” explained José Luis Benitez, general director and founder of Industrial B&S de México, which utilizes laser cutting, plasma cutting, turning, and milling for small to medium pieces.

Habilitaciones y Servicios Industriales (HASEIN), a family-owned company founded in 1977, is one of the only cluster members presently servicing the industry, manufacturing approximately 150 different aerospace parts. “Just two years ago, we moved to a new facility which encompasses all of the computer numerical control (CNC) machines that are required to meet the aerospace industry’s needs… HASEIN has a team of experts in logistics as well as extremely reliable raw material suppliers,” explained Elaine Carrera, managing director of HASEIN. “This is key for the aerospace industry, and it is something La Laguna region has targeted as a necessary means of improvement.”

Within La Laguna, one can find a variety of processes, attributed to the high level of vertical integration and low-volume, high-mix model of the established facilities—CNC machining, anodizing and chemical processing, HD plasma and laser cutting, bending, rolling, welding and liquid or powder painting, destructive and non-destructive testing, assembly, etc. Kimball Solutions, a FEMIA member and family-run business since 1966, has heavily invested in its ability to supply a majority of the above. “Kimball Solutions would like to offer the aerospace industry as much as we can, but we want to be experts in a process before we offer it as a service to our customers. We can start supplying machine parts…as we have multiple two-axis and three-axis CNC machines, break presses capable of supplying 200 tons, and a FARO machine,” explained Arturo Dueñes, general director of Kimball Solutions.

One of the most interesting additions to the gamut of aerospace companies is Ropa Siete Leguas, the entirely Mexican, high-fashion jeans manufacturer for American and European brand designers. Similar to Chihuahua’s success story of SOISA Aerospace, Ropa Siete Leguas hopes to apply its textile talent to aircraft interiors and seating. “If you look at an airplane, there are stitches everywhere,” explained José Juan Marcos González, CEO and son of the founder of Ropa Siete Leguas, “With our sewing capacity and lean-manufacturing procedures, we can become a more efficient and reliable supplier to aerospace customers.”

The facility employs over 6,000 people and has been described as a small city within Lerdo City. Fully capable of all necessary means of self-investment, Ropa Siete Leguas has a research team working on strategies to strengthen its aerospace accreditation and preparation movements. “When Marcos says he is breaking into a new industry there is no doubt that he will accomplish it,” said Martha Elvira Meza Meléndez, director of ProMéxico for Coahuila. “He is a strong businessman with impressive foresight. Locals say he ‘defeated the desert’, and it is true, the climate has forged these strong businessmen; the environment has not given any other choice. They are always overlapping projects.”

Advantageously located and a historically attractive maquiladora destination, La Laguna has a strong foundation on which to build in aerospace. The eight pioneering companies—all of whom are interviewed in the following chapter—exhibit unified devotion, which translates into immense potential; however, to ensure the success of their efforts, more companies need to subscribe to their mission. There is power in numbers and value in cohesion when attempting to attract OEM and maintenance, repair and overhaul attention and the small cluster is well aware that it still has a lot to prove. “We have already shown that we can provide quality equal to any country in the world and we have the capacity to acquire high-tech equipment; that just needs to be translated into aerospace…” By 2019, Coahuila should be an important aerospace manufacturing platform, much like other aerospace hub states. **

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- Alejandro Cabello, Managing Director, Intelligent Sourcing Solutions
What certifications were necessary for HASEIN to be able to work with its international aerospace clients?
HASEIN had to be ISO 9001:2008- and AS9100-certified. The company has been working under ISO for 14 years and four years with AS9100.

What is HASEIN’s current and intended involvement in the aerospace industry?
HASEIN currently supplies approximately 150 different parts for Rockwell Collins, but is in the process of expanding its client base. At the moment, HASEIN’s aerospace manufacturer constitutes for about 35% of total production. We are aiming for this percentage to grow to 50% of our overall output.

How available is machining, plastics injection, metal work, etc. in La Laguna?
Are there plans for expanding your offerings?
We know there are 10 companies certified that offer their services to the aerospace industry, seven of which are located in Torreon, and HASEIN is one of them. HASEIN hopes to continue expanding steadily, possibly opening another plant in the United States or in another state of Mexico. With the continued support of the local government as well as organizations like ProMéxico, we are confident that HASEIN will continue developing. Just two years ago, the company moved to a new facility which houses all of the CNC machines that required to meet the aerospace industry’s needs. In this plant, HASEIN has the space to grow production capacity by 40%, and is constantly analyzing opportunities for equipment additions and new technologies to optimize its processes.

On-time delivery is critical for manufacture- ers’ productivity. How is HASEIN able to ensure that delays are avoided?
HASEIN has a team of experts in logistics, as well as extremely reliable raw material suppliers. This is key for the aerospace industry, and is something that the La Laguna region has targeted as a necessary means of improve- ment.

Can you provide a brief history of HASEIN and its operations in Mexico?
HASEIN was founded by Zaide Carrera, and its operations in Mexico?
Zaide Carrera and Jaime Carrera

HASEIN offers injection and blow molding, deep draw, conventional machining, computer numerical control (CNC) machining, wood, and metal mechanical, among others.

HASEIN began with merely working with conventional machining equipment. To expand our services, we incorporated CNC equipment. This optimized production and efficiency, as we could manufacture more parts per minute. These kinds of advancements have been critical for our success, which is why we keep an open mind and progressive attitude toward technology.

How will the aerospace industry in Coahuila evolve over the coming years?
We have great confidence that Coahuila will have significant development in the coming years. We have seen the interest of other companies, which are already seeking certification to participate in the aerospace industry in Mexico. The government and organizations such as ProMéxico are incredibly supportive, which is why I have no doubts that in the next few years, Coahuila will become one of the most developed entities of local suppliers.

Would you say there is a sufficient enough pool of talent from which HASEIN can pull employees?
No, our main challenge is finding qualified technicians. Even those that are the most prepared still lack significant knowledge. Most employees arrive with about 50% prepa- ration completed, and HASEIN finds it necessary to develop the skills needed to service the aerospace industry.

Can you provide a brief background to Deltaplast’s operations in Mexico?
Deltaplast started as part of the French industrial group, Plastibell, which was established in France in 1971. Deltaplast began operations in Mexico in 1999, as Thompson Electric Televisions requested Plastibell’s presence in Torreon.
Deltaplast began supplying for the aerospace industry in 2008, and is finding it necessary to start expanding its facilities and move closer to its customers. We are eager to further de- velop our customer base in the aerospace in- dustry.
Deltaplast’s expansion strategy is to purchase an existing company or, if we are growing, we will be starting a new operation from scratch.

Do you have a final message?
HASEIN has been a multinational company since its inception, and is finding it necessary to start expanding its facilities and move closer to its customers. We are eager to further de- velop our customer base in the aerospace in- dustry.

What are some of the challenges of working in both the automotive and aerospace industries?
The aerospace industry involves high vol- umes, compared to mix of volume of aero- space. Operations in the two sectors are different, and Deltaplast tries to price-com- pete by strategically assigning the right resources. The management and cycle of pro- duction differs in the two different sectors, and the automotive industry is focused on producing a lot of parts. The aerospace industry utilizes more technical parts, and the raw materials used are different.

What are some of the strengths that La La- guna offers to potential investors?
La Laguna offers both a community and an area that have a high level of education, as there are many strong universities. The workforce is dedicated and trustworthy, and the employee turnover is low. The government is focused on developing all sectors and offers support to potential companies looking to enter aero- space. In terms of logistics, transportation of raw materials and supply chain costs, Coahuil- la is economical compared to other regions.

What goals would Deltaplast like to achieve over the next five years?
Deltaplast has doubled its sales in only two years, and expects to again double its sales in 2017. The company wants to acquire new customers and is finding it necessary to start expanding its facilities and move closer to its customers. We are eager to further de- velop our customer base in the aerospace in- dustry.
Deltaplast’s expansion strategy is to purchase an existing company or, if we are growing, we will be starting a new operation from scratch.

Can you elaborate on Deltaplast’s Mexico facility and any attained certifications?
Our facility is 4,000 square meters. Currently, we have 33 presses ranging from 50 tons to 350 tons. Deltaplast is planning to expand its operations to other regions of Mexico. Radiall, which is our main customer for aerospace parts, is already operating in So- noran and successfully pushed for us to move there. Deltaplast has an investment to establish a new facility there that will help it to consoli- date its 2021 vision. In 2015, we have supplied over 12 million, which grew to 16 mil- lion in 2016 and is projected to be $24 million in 2017. For 2020, the aim is to have a turn- over of about $50 million. To achieve this, an expansion is practically required.

On March 2015, PSB Industries acquired Plastibell Group, which positioned the compa- ny as a major player in plastics for the health- care, automotive, aerospace and industrial markets, complemented the Texen and CGL Pack brands, and contributed to the combined strength of both groups in having a global presence.
PSB INDUSTRIES Group with production plants in France, United States, Japan, Poland, Korea and Mexico reported consolidated revenues of 262 million Euros in 2014, 60% of which cor- responded to international sales.

The growth strategy for PSB INDUSTRIES is to achieve a turnover of 600 million Euros by 2020.

What is the scope of the capabilities that Deltaplast is able to offer to the aerospace industry?
Deltaplast produces thermoplastic parts, but through the partnership with Radiall, we are focusing on connectors used in Boeing and Airbus aircraft. The connectors are assembled on the aircraft and are used for all electrical connections on the planes. Deltaplast supplies the plastic parts in which we are distributing for the rest of the process. Our aim is to diver- sify our market and evaluate any new potential aerospace partnerships.

What would you say is the diversity and size of your product service offerings?
HASEIN manufactures products for a vari- ety of industries, including mining, medical, aerospace, food and beverage, industrial pack- aging and machinery, and product design. HASEIN offers injection and blow molding, scanning, and computer numerical control.
Breaking into the aerospace industry can be challenging in terms of international standards, and big companies are looking for manufacturers with experience. What is Industrial B&S’s strategy for making a transition into the aerospace sector? Industrial B&S’s strategy is to show international standards to other very well. The local companies have been in the region for years and are still operating here and trying to attract more offers from outside the region. Our parts are not sold within the region, but rather sent to other parts of the country. The Laguna cluster will be a reference for other industries and regions, as we have knowledge and greatly support each other to ensure that we are providing good offers to the outside markets.

Is product testing of component parts a necessity for aerospace growth. Academic institutions require that product quality of the industry. Academic institutions are making great efforts to grow within the region and diversify its materials for different sectors. We differentiate ACV from competitors that is it has the best welding processes according to our customers. We can weld any material from aluminum to stainless steel, which is a rare capability. We can manufacture very large products as well as low-volume, high-mix products, giving us an advantage. We have an excellent management team that handles planning processes, oriented with on-time delivery, cutting inventory and slicing costs.

Can you provide a brief history of Industria B&S de México? Industria B&S was founded in 1999, with a focus on manufacturing components for construction equipment. We identified a need in the market and diversified our capabilities to offer oxy fuel, plasma and laser-cutting services to supply parts for machining. The business grew significantly over the years, and we decided to invest in other components, as well. Industria B&S invested in manufacture components for the electrical- and mechanical-motion control and power-generation products. We also invested in the oil and gas industry and the aerospace industry, as we wanted to manufacture more complex parts.

What is the global footprint of Industrial B&S in respect of its international clients? What certifications correspond with this work? We have a certified manufacturing facility that houses approximately 100 employees. Industrial B&S& obtained AS9100 certification in 2015 in preparation for operations within the aerospace industry. Our clients mainly operate in the construction, electricity, mining, motors, and mining industries, and the oil and gas segment is currently small. We do not have any clients in the aerospace industry, as we are still preparing and testing our systems before we offer our capacity.

Can you elaborate on the current capabilities of the aerospace R&D facilities, and will the company be able to keep up with the requirements of aerospace companies? Since the establishment of Industrial B&S, we have invested in equipment that has both the capacity to produce precision components and is easy to program with Mazak machines. For more complex components, we have invested in Cad-Cam software which will help us to have much better programs for part development. We have equipment of various axis’, with different capacities and speeds and for different materials. Industrial B&S has experience with components from different sizes, tolerances and materials.

In the region, the adaptability of our capabilities is unique to our facility. We can support a high-mix, low-volume demand and can monitor where in the process our components are and what is our capacity used. By monitoring our processes, we can deliver our products on time to our customers. Industrial B&S has experience with components from different sizes, tolerances and materials. The difference between Laguna and other regions in Mexico is that Laguna is mainly formed by local industries. Laguna is a natural cluster; the members of the industries know each other very well. The local companies have been in the region for years and are still operating here and trying to attract more offers from outside the region. Our parts are not sold within the region, but rather sent to other parts of the country. The Laguna cluster will be a reference for other industries and regions, as we have knowledge and greatly support each other to ensure that we are providing good offers to the outside markets.

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Do you have a final message for the international aerospace community looking at Laguna as a potential aerospace destination? Mexico is a growing country that is eager to perform much better in the global market. Laguna is looking to improve its industries as well as the lifestyle of its citizens. The region offers a good opportunity for supplying components to the aerospace industry who are making great efforts to grow within the industry and supply better and cost-efficient products.

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Can you explain the diversity and size of your ISS’ product/service offerings at present?

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ISS is a sheet/plate metal structural fabrication and engineering design company. Manufacturing capabilities include special-purpose piping, fixtures and brackets, structural metal components and parts, CNC machining, metal forming, water jet cutting, bending, welding and small sheet metal assembly. We work with three main materials: carbon steel, aluminium and stainless steel. The aerospace industry requires alloys, which we can also provide. ISS also has a design and engineering division that focuses on finite-element analysis, structural design, project to mention processes and specialized software. The specialized software’s includes NX (Nastran), Inventor, Design Triumph, CAD/CAM and CAE.

Can you give a brief introduction to Intelligent Sourcing Solutions (ISS)?

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In 2012 ISS started an advanced manufacturing division, and our main goal is to integrate our manufacturing scope with our logistical expertise. Our philosophy is based in three main aspects: qualified & motivated people, high tech machinery and value added engineering development, and innovation. ISS’s main goal for the future is to expand our capabilities and presence within the aerospace industry.

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This policy has allowed us to become one of Mexico’s most important aerospace companies, and has enabled us to grow significantly. In the past, the companies operating in the aerospace sector were growing separately but there is a significant push towards integration and synergy between government universities and the private sector. The La Laguna region will experience significant growth and witness an aerospace boom. The government is focused on developing a cluster and the location of La Laguna has a great advantage. The region also has substantial universities and technical schools and can soon offer skilled human resources to the sector.

What are your expectations for the aerospace sector in the La Laguna region?

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Can you elaborate on the in-house training of Kirbymex?

Our personnel are one of our most important assets. Our facility houses 250 employees who continuously undergo equipment and software training. Every six months, our operators apply for an exam towards achieving level A, which is the expert; they start from level E, which is basic knowledge of machining. Based on their skill level, further training is scheduled. All work groups are also supported by programs such as Kaizen Multi-Functional Teams, SPC, 5S, and Six Sigma Black Belt. Ongoing improvement is encouraged by having our workforce come up with innovative ideas that are tracked on our floor displays.

Kirbymex started completely dedicated to the agricultural sector, but this sector is only contributing 3% to your business today. What percentage does Kirbymex hope the aerospace sector will contribute?

Our focus in the aerospace sector is currently in the Ground Support Equipment segment. This segment represents 27% of our business and we expect this percentage to grow up to 33% during 2016. The challenge is to double our sales in the aerospace sector by the end of 2017.

Do you have a final message for our international aerospace community?

Investors who are looking for reliable and eager additional suppliers will be pressed when they visit La Laguna and witness the capabilities that the area has to offer. *

Can you give a brief introduction to Kirbymex and how the company has evolved since its establishment?

Kirbymex is a family-owned manufacturing company that has been present in the national and international market since 1999. In the beginning our main product focus was on the agricultural sector, but this sector has evolved and now Kirbymex and how the company has evolved?

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In 2003 Kirbymex started to manufacture cutting machines. Based on their skill level, further training is scheduled. All work groups are also supported by programs such as Kaizen Multi-Functional Teams, SPC, 5S, and Six Sigma Black Belt. Ongoing improvement is encouraged by having our workforce come up with innovative ideas that are tracked on our floor displays.

Kirbymex started completely dedicated to the agricultural sector, but this sector is only contributing 3% to your business today. What percentage does Kirbymex hope the aerospace sector will contribute?

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We have now proven to be successful at bringing corporations here, resulting in them making significant savings and managing well. The next step is to create mutually beneficial partnerships between them, making local investments, combining assets, sharing knowledge and fostering growth.

-Luis Lara, Chairman of the Board & CEO, American Industries

CONCLUSION: MEXICO STAKING ITS CLAIM IN THE GLOBAL AEROSPACE INDUSTRY
There is no doubt that Mexico is becoming a key player in the global aerospace manufacturing industry, and the federal government has implemented several measures to assure that will be among the 10 largest providers of this industry before 2020.

In our 30 years of experience supporting the aerospace sector in Mexico, we have witnessed the evolution of the automotive, electronic, and medical sectors from cost centers to a profit centers and from manufacturing plants to a shared-services centers. How ready is the aerospace sector to achieve this level of maturity and what needs of human capital competences are required to achieve this?

To answer this question, we must answer three questions: (1) in which stage of competitiveness is Mexico as a country?, (2) what will be the global demands in aerospace for the next 10 years?, and (3) how is the aerospace value-added curve in Mexico?

Mexico's Competitiveness Stage

According to the World Council Forum 2014/2015 competitiveness report, Mexico is transitioning from the second stage focused on efficiency to the third stage focused on innovation. In order to achieve this transition, corporations must work together with educational institutions to produce the professionals with the necessary technical and soft skills. Fortunately, in 2007, Mexico founded the Mexico Council for Aerospace Education (COMEA), which is integrated with universities and technical institutions to meet this need.

As reported by COMEA, Mexico has 52 educational programs in 12 states, 30% of which are for engineering careers and 16% of which are for post-degree studies at the Master's and Ph.D. levels, and, as stated by PROMEXICO, each year graduates 90,000 engineers.

Aerospace Global Trends in Aircrafts

The CIT 2015 aerospace study conducted by Harris Poll among 100 of the top global airlines executives showed that in the next five years, the major trends in aircrafts manufacturing will be concentrated in: technology innovations (75%), social media (57%) and air safety (55%). Therefore, airframers will launch replacement programs for the single-aisle market before 2030, with a projected demand of over 25,000 commercial aircrafts.

Mexico Aerospace Value-Added Curve

At the moment, 29% of the aerospace plants in Mexico are dedicated to manufacturing and assembly processes, 11% to engineering services R&D, and 10% to MRO. From the 270 suppliers of this sector 23% are Mexican companies, supplying mainly to tier-three companies.

Human Capital Stage and Competencies Required in the Aerospace Sector

As we have seen, Mexico is in the transition from the efficiency stage to the innovation stage, and, according with Harris Poll study, the name of the game in the single-aisle market will also be innovation; nevertheless, only 11% of the aerospace operations in Mexico are concentrated in engineering services and R&D.

In research conducted by IDEIA and ABT associates about human capital needs in Mexico’s aerospace sector, the main deficiency was the need for soft skills such as interpersonal skills, team working, multicultural exposure, analysis, problem solving and business sense, in order to understand the economic impact of decision making. These skills are also marked as critical in the study conducted by the Institute for Defense Analysis and the Society of Manufacturing Engineers for the aerospace sector in United States.

Nevertheless, at Corporate Recruiters, we have found that soft skills are the most hard to define by our clients and therefore the most difficult to evaluate. For this reason we have supported them to elaborate solid job descriptions and create a search plan by using our Competencies’ Pyramid (1) system that has been the result of our 30 years of experience in the manufacturing industry.

Our evaluation system contemplates five levels of competencies: personal, position-related, manufacturing sector, management, and global competencies. For each level it is important to identify the proper competences according with the moment and dimension of the operation, and as well as the challenges and responsibilities of the position. It is also important to assign value to each competence in order to evaluate candidates match accordingly.

The Take Off

Mexico already has a well educated workforce and a proven manufacturing market, but, in order to soar to the next level, educational institutions and corporations must work together to create programs focused on developing skills in all positions related to R&D, NPI supply chain and liaison functions among local plant, headquarters and tier-one and tier-two suppliers. Fortunately, global companies such as Bombardier and Honeywell and educational Institutions such as CETYS and Instituto Tecnologico de Monterrey are working together to develop R&D programs with state of the art laboratories.

Companies will have to put in place training and developing programs to foster soft skills such as global awareness, languages, multicultural team working, business sense, IT tools proficiency, information literacy, analysis, decision making and critical thinking. In the market these competences will be highly demanded commodities, therefore companies with the right training programs to develop and recruit professionals with these skills will prevail over their competitors.

If you want to know more about this article please feel free to write to joseflores@gLOBAL-recruiters.com

Could you provide a brief overview and history of Transtelco?

Transtelco was founded 15 years ago in Ciudad Juárez, with the goal of bridging the communication gap between the United States and Mexico. We wanted to create an efficient and streamlined communication system between both countries. The largest players in the telecommunications industry in both countries only served their respective national market. Hence, Transtelco saw an opportunity to become a telecommunications player with operations on both sides of the border.

The arrival of international companies to Mexico brought to light the complexities of dealing with two separate telecommunications carriers to connect operations on both sides of the border. Transtelco wants to solve this coordination problem and offer a one-stop solution.

What attracted Transtelco to offer services in the Querétaro region?

As home to one of the main aerospace clusters in Mexico, Querétaro has some of the largest, global aerospace multinational companies in the country. These companies need high-quality, real-time communication systems to run their operations.

What are some major challenges that Transtelco has encountered in the aerospace sector?

What are some major milestones for Transtelco in the next five years?

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Made With Precision and Intent
The Future of Mexico’s Aerospace Industry

With $1.8 billion in aerospace foreign direct investment over the past ten years and $6.4 billion in aerospace exports in 2014, Mexico is an increasingly important global player. President Enrique Peña Nieto recently announced that Mexico is now ranked sixth among the suppliers of this industry to the United States, a number that is expected to climb even further now that composites are being added to the southern neighbor’s repertoire. What was once an emerging industry has now solidified itself as a national priority and government intervention into aerospace is more than complementary. The National Flight Plan aims to fully take advantage of cost competitiveness with the ambition to produce nearly every part of the complete aircraft; this plan, however, cannot be completed without state synergy. As realized by researching each of the five major Mexican aerospace hubs, the uniqueness of each cluster contributes differentiated and important elements to the overall picture. To fully maximize this potential, the next step should be to ensure all clusters are painting on the same canvas. Though Mexico has attracted seven original equipment manufacturers to establish themselves within its borders, the government’s main priority is filling the many persisting gaps in the supply chain, but it is unclear if this is being done in a unified manner. The Boeing 737—one of the smallest and most popular commercial jets—is made up of 367,000 parts and, over the next decade, commercial aircraft annual production levels are anticipated to increase by an estimated 20%. By 2033, more than 31,350 new passenger and freight aircraft are expected to take flight. It is rare to find an overarching expansion effort into Mexico as a whole and, though there is great cohesion and logistical stability within each respective region, there lacks interconnectedness between the not-so-distant clusters. Shortages or vacancies at one hub are rarely taken care of by another; the United States remains the prime destination for any and all deficiencies. Mexico needs to better capitalize on its profound diversification, as this would increase not only attractiveness but also efficiency. Yet, being that 45,000 Mexicans are employed in the industry, aerospace development is undeniably progressing. In 2007, Mexico housed 150 aerospace factories. Today, there are over 300 companies and support organizations, most of which have NADCAP and AS9100 certifications. One of the largest is Safran Group, Mexico’s leading aerospace employer and a principal investor. At the start of 2016, Safraon not only opened a new plant in Chihuahua and Querétaro, but announced its dedication to invest $74 million for the creation of a new LEAP engine facility. Parts at this plant will be using composite materials, making engines lighter with less pollution via the latest technology. Growth of the sector has been arbitrarily resilient, at a registered 15%, as a result of companies realizing the full potential that Mexico has to offer. Multinationals such as Safran that have already chosen Mexico as a destination help mitigate the negative stigma that were previously attached with the country’s brand. Crime rates and drug lords are typically the only newsworthy pieces picked up by the international press, and the successes of stability and friendly trade policies are overlooked. There are many misconceptions about the capabilities of the country; beyond its maquiladora mystery, Mexico’s world-class engineers and state-of-the-art research and design centers are unintentionally undervalued. As portrayed in each preceding chapter, more aerospace parts are made in Mexico than expected to take flight. It is safe to say that the opportunities of aerospace parts suppliers are evident, but most companies are preoccupied with weighing the costs and benefits of one state versus the other. It is rare to find an overarching expansion effort into Mexico as a whole and, though there is great cohesion and logistical stability within each respective region, there lacks interconnectedness between the not-so-distant clusters. Shortages or vacancies at one hub are rarely taken care of by another; the United States remains the prime destination for any and all deficiencies. There is a great deal of talent and patience residing within the country and companies are finding that skills of this kind are invaluable and irreplaceable—those that have relocated to Asia are making their way back to Mexico to re-open facilities. There is a great deal of talent and patience residing within the country and companies are finding that skills of this kind are invaluable and irreplaceable—those that have relocated to Asia are making their way back to Mexico to re-open facilities.

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For updated industry news from our on-the-ground teams around the world, please visit our website at gbreports.com, subscribe to our newsletter by signing up to our VIP list through our website, or follow us on Twitter: @GBReports.

Additional copies of this book can be ordered through Elif Ozturk (elif@gbreports.com)

THANK YOU

We would like to sincerely thank all the governmental bodies and associations that took time to share insights into the market as well as their experience and knowledge.

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