GLOBAL BUSINESS REPORTS

INDUSTRY EXPLORATIONS

MEXICO AEROSPACE

2016

Aerospace - Clusters - Original Equipment Manufacturers
Tiers Ones - Sub-Tier Suppliers - MROs - Education

PRO MÉXICO

SUPPORT AND SERVICES CATALOGUE

SUPPORT GRANTS

01 Support to International Business Representatives
02 Technical Advice in Production Processes or New Product Development
03 Travel Bursary
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05 Constitution of Companies Abroad
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Dear Reader,

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.

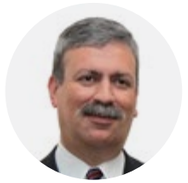
From a national perspective this sector is considered strategic for its growth potential, its contribution to technological development, competitiveness and its high sophistication in their exports, that reached 6,686 million dollars in 2015, a 5% increase from the previous year. The growth of the Mexican 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 Gabrielle Morin, James Hogan, Ty Jeevaratnam, Meredith Veit, Josie Perez, Juan Pablo Buerba, Agostina Da Cunha, and Mungo Smith.

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Baja California

Chihuahua

Nuevo León

Querétaro

Sonora

La Laguna

Exclusive Interviews

Leaders from both the private and public sector delve into the nuances and nascent developments that are shaping the industry.

9, 18, 26, 41, 60, 71 and many more

Editorial Content

Global Business Reports' journalists provide on-the-ground analysis of the trends that are shaping Mexico's aerospace industry.

11, 22, 23, 34, 56, 65, 77, 82 and many more

Quantitative Data and Maps

Quantitative data help readers better understand the position of Mexico, especially relative to its global competitors.

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Supply Chain

Over 300 players are now operating in Mexico's aerospace manufacturing sector. GBR goes in-depth to describe how gaps are currently being filled across the country's supply chain to support original equipment manufacturers.

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Future Outlook

Aerospace is at the cutting edge of technology and design. Mexico is establishing itself as a global manufacturing player and leaders share their visions on the future of the industry.

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Image: Zodiac Aerospace

SYNERGY THROUGH DIVERSITY: AN INTRODUCTION TO MEXICO'S FIVE MAIN AEROSPACE CLUSTERS

"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

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 (1,900-mile). 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 destined for the United States. According to the Congressional Research Service, Mexican exports to the United States from $39.9 billion in 1993 to $280.5 billion in 2013. Since assuming office in December 2012, the Mexican President, Enrique Peña Nieto has passed a series of reforms in education, telecommunications, tax reforms, and most notably energy, which had been nationalized since 1938.

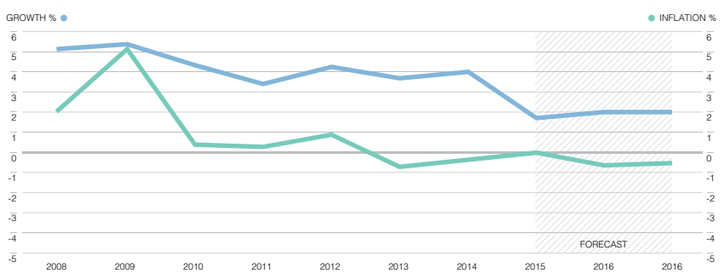
MEXICO AT A GLANCE

Source: CIA World Factbook

Population: 121,736,809 (July 2015 est.)
Land Area: 1,964,375 sq km
Official Language: Spanish
Capital: Mexico City (Distrito Federal)
Chief of State: President Enrique Pena Nieto (since December 2012)
Head of Government: President Enrique Pena Nieto (since December 2012)
GDP (PPP): $2.22 trillion (2015 est.)
Growth Rate: 2.3% (2015 est.)
GDP per Capita: $18,500 (2015 est.)
GDP Composition by Sector: 3.5% agriculture, 34.1% industry, 62.4% services (2015 est.)
Exports: $430.9 billion (2015 est.): manufactured goods, oil and oil products, silver, fruits, vegetables, coffee, cotton
Imports: $434.8 billion (2015 est.): metalworking machines, steel mill products, agricultural machinery, electrical equipment, automobile parts for assembly and repair, aircraft, aircraft parts
Major Trade Partners: United States, China, Japan

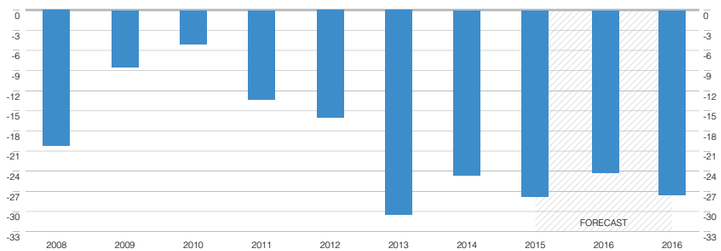
MEXICAN GROWTH VS. INFLATION, 2008 TO 2017

Source: International Monetary Fund



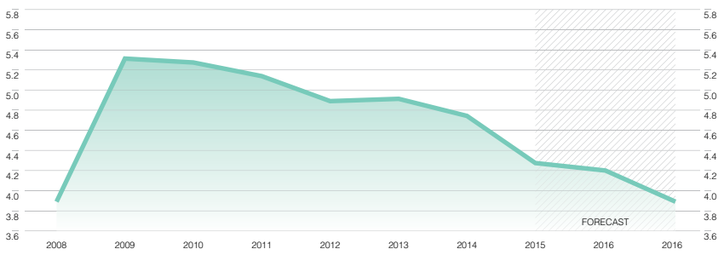
CURRENT ACCOUNT BALANCE ($ billions), 2008-2017

Source: International Monetary Fund



UNEMPLOYMENT RATE, 2008-2017

Source: International Monetary Fund



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 industry 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 are. 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 his 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 favorable conditions 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, ProMexico 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 otherevents. 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 FEMIA 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 aeronautical company held in Mexico. •

Luis Lizcano

General Director
MEXICAN FEDERATION OF AEROSPACE INDUSTRIES, A.C. (FEMIA)

Can you introduce FEMIA by providing a brief history of the association?
There has been a constant growth within the aerospace industry in Mexico. From 2004 to 2014, we have been growing at an average rate of 17% per year. This growth necessitated the emergence of some kind of association of aerospace companies. In 2007, FEMIA was established under that premise, and currently includes around 90 member companies.

Can you describe the organizational structure FEMIA and discuss some of the principle needs of the industry that it seeks to address?
Comprised by a very small staff that supports a board, we work under the following four pillars: competitiveness (supply chain development), human capital development (working together with industry and academic institutions to pursue new skilled human capital), institutional relations (interact with agencies, various levels of government in Mexico, and different clusters and organizations like FEMIA globally to share and develop relationships), and promotion (we have a group that is in charge of promoting the aerospace sector in Mexico and internationally)

Can you talk about the efforts that FEMIA are 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 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 who have the proper skills to then grow the supply chain. And where technologies that are not available in Mexico are required we then invite companies to operate in Mexico to supply the North American market.

How does FEMIA link academia to industry?
We serve as the linkage point between academia and some companies, by actively working to fill the gaps in academia identified 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 Mexico is undergoing. To curtail this issue, we are promoting technical level educational institutions in the areas 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 promoting 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 this goal. 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. •

INTRODUCING MEXICO'S AEROSPACE INDUSTRY

Image: Safran Labinal

In the past decade, there has been more aerospace-related foreign direct investment in Mexico than in any other country in the world. According to Fernando González Díaz, CEO of ProMéxico, "the sustained growth of the Mexican aerospace industry is the result of coordinated industry, academia and government jobs." The continued development of the aerospace sector in Mexico has given rise to five distinct clusters: Baja California, Chihuahua, Nuevo León, Querétaro, and Sonora. After conducting seven months of research on the ground, this in-depth report is a culmination of our findings across these five these states, as well as an introduction to Coahuila as an up-and-coming Mexican aerospace destination.

Baja California's aerospace cluster began fifty years ago and has evolved into the largest and most established aerospace cluster in Mexico today. Its 80-plus aerospace companies are spread between the clusters of Tijuana and Mexicali and the cities of Ensenada and Tecate. The state is home to companies such as Honeywell, UTC, GKN and Eaton, with a clear focus on electrical and electronic systems, engine parts, assembly of interior and seats, control and navigation instruments, and engineering and design.

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, to 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

MEXICO AEROSPACE EXPORTS, 2004-2014 ($ millions)
Source: ProMéxico, via Ministry of Economy, DGIPAT, with data from DGCE-Banxico.

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 Exova and Grupo Forem. Monterrey is also home to a competitive MRO market centered on the city's private Aeropuerto del Norte. The state government and the Monterrey Aerocluster hope to grow the aerospace sector by attracting a prime contractor that would stand to gain the most value from what Nuevo León can offer and likewise bring the most value to the state.

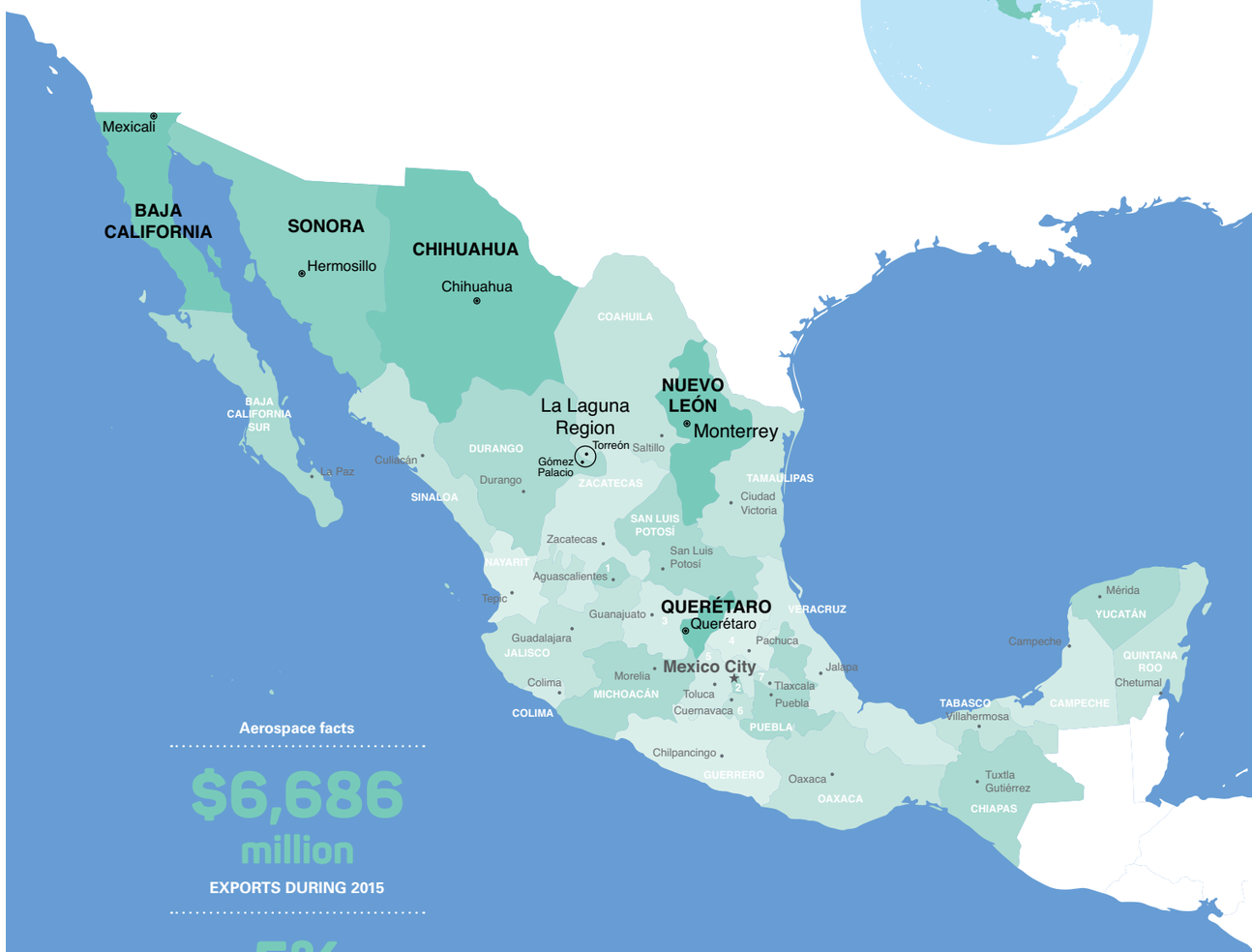
Querétaro's aerospace sector, on the other hand, also emerged recently in 2006 with the arrival of Bombardier. Today, the two other major players in the state are Airbus Helicopters and SAFRAN Group. The state's 40-plus companies also include a few international tier-one and tier-two companies, which are centered around the state's capital, Santiago de Querétaro. The state 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 burnishes 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. •

MEXICO'S FIVE MAIN AEROSPACE CLUSTERS + LA LAGUNA



Aerospace facts

$6,686 million
EXPORTS DURING 2015

5%
GROWTH OVER 2014

$1,033 million
FAVORABLE BALANCE IN THE TRADE BALANCE IN 2015

Source: Proméxico

1. AGUASCALIENTES
2. DISTRITO FEDERAL
3. GUANAJUATO
4. HIDALGO
5. STATE OF MEXICO
6. MORELOS
7. TLAXCALA

Francisco Bautista

Senior manager Global Trade and Investment
ERNST & YOUNG

We would like to start with a brief introduction to the services that Ernst & Young (EY) offers to the aerospace sector in Mexico.
Ernst & Young (EY) has been in Mexico for over eighty years, serving several aerospace clients through our four service lines, which include tax, transaction-advisory services, business advisory, and assurance services. The latter is mainly auditing services but as global chains become more integrated it has become critical for companies to create strategies around the tax and administrative part, feasibility analysis, supply-chain-network analysis, entry-strategy models, site selection, business and financial case for new investments. 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?
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 manufacture, and then exporting the final product is not easy for the companies. 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 on a whole different spectrum than other companies trying to enter the country. Most investments in Mexico are created with a strategy to reduce costs by taking advantage of the federal programs like maquiladora, 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; however, companies do not focus solely on the hourly wage, but also on the productivity of the worker. Aerospace companies are looking more at the cost per piece, and not necessarily the wage per hour, which is where Mexico excels. Furthermore, Mexican workers are extremely proud and loyal to their companies. It is no cliché that within the aerospace sector in Mexico, the success of the company is derived from the success of its employees, which is why companies are so protective of them.

You mentioned that employees are very loyal, but what does the aerospace sector believe the workforce lacks?
Mexico produces more engineers per capita than the United States. This sounds impressive, but it does not benefit the aerospace industry and the oversupply floods the marketplace, diminishing the return on the students' engineering education. Most of the engineering graduates have a 'desk' engineering degree, but the industry needs technicians, which is less 'chic' and starting salaries are quite low. Understandably, students do not want to get a technician degree. The irony is that given the short supply of technicians in Mexico, international firms are willing to pay great money, as much as they pay their technicians in Europe or North America, in order to secure professional technicians.

The industry will undoubtedly continue to grow in the years to come, but what areas need to be address in order to achieve greater growth?
Aerospace in Mexico is still in its infancy. We have significant players doing very specialized manufacturing. Mexico has yet 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 occurs 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, it should grow its support industries. Separately, the industry in Mexico has not done an adequate job promoting itself. The industry has been growing in the double digits for the last ten years and employs more than 40,000 people, yet it is still Mexico's best-kept secret. One could argue that this is because most of the long-term contracts are negotiated at headquarters, while the operations are mainly here and they focus solely on quality and manufacturing standards. Several large corporations that are looking to increase visibility and brand awareness today have established corporate offices in Mexico like Airbus group or Safran Group, but growth will increase even more once small and big players alike adopt a similar approach. •


LPD


EOL

Luis Pérez Delgado & Elisa de la O López

LPD: Senior Partner
EDO: Lawyer
GOODRICH, RIQUELME Y ASOCIADOS

Can you provide us with a brief introduction into Goodrich, Riquelme & Asociados (Goodrich)?
LPD: Goodrich is one of the most prestigious, widely respected and innovative law firms in Mexico City. From its inception in 1934, the firm has specialized in representing companies doing business in Mexico in all legal aspects at every level. The vast majority of its clients are medium and large companies, some of which are in the 'Fortune 500' category. As the firm has a strong international orientation, a number of our attorneys have lived, trained, and are qualified to practice in other countries as well as being multilingual. Today the firm has a professional and administrative staff of approximately 200. Goodrich's main practice areas cover: aerospace, automotive and transportation in general, as well as corporate, mergers and acquisitions and commercial transactions, taxation, customs and trade regulation, and many more. Goodrich actively promotes foreign investment in Mexico through conferences, presentations, and trade missions in Mexico and abroad in collaboration with different public and private organizations such as ProMéxico and the different European Chambers of Commerce and Consulates.

What services does Goodrich provide to the aerospace industry?
LPD: There are very high expectations for the aerospace industry to create exponential growth for the Mexican economy, as it is generating employment and incrementing technological capacities as well as transforming the skills of the labor force. For the firm, the aerospace industry represents an important area of opportunity as this sector may experience 5% to 15% growth during the next 10 years in the value chain of suppliers. Our firm has represented aviation clients for several decades, granting us extensive experience advising clients in investment, company acquisitions, capitalizations, aircraft parts concessions and aircraft registration. However, our aerospace practice group and full-service law firm may advice companies on the following services: intellectual property and protection of patents, designs and technology development, procedures before the general direction of civil aeronautics, labor advice, tax and customs advice for the aerospace industry, advice for maintenance, repair and overhaul companies, and advice for original equipment aerospace manufacturers, just to name a few.

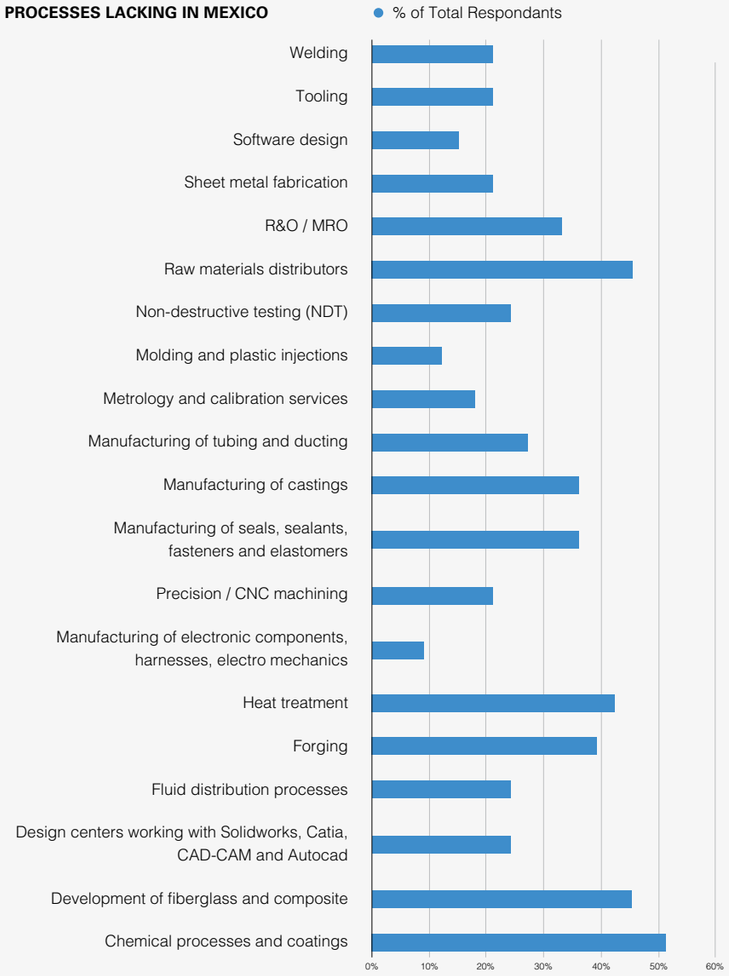
How have NAFTA and MEUFTA helped to grow the aerospace industry in Mexico?
EDO: The main impact derived from NAFTA and MEUFTA can be seen in the reduction of duties. With NAFTA, duties that were approximately 15% to 20% are now exempted with respect to import tax. Thanks to this benefit, it is enough for a company to be registered in the National Importers' Registry for it to obtain the corresponding NAFTA origin certificate to have right for exemption rates when importing parts, components, and raw materials for the aerospace industry. As for parts, with the MEUFTA certificate of origin, the same are also exempted, being subject to the applicable rate is only MXN$300 for customs service per import declaration. In both cases, VAT (16%) on imports shall be paid. Additionally, Mexico offers the IMMEX program, which allows the importation of goods, machinery, and raw materials on a temporary basis, which are utilized in production and then exported as a finished product.

While there is great potential for the industry, what are the greatest obstacles that it still faces?
EDO: Aerospace is one of the most strategic sectors for the country's development. It is an industry for which Mexico offers significant competitive advantages and, at the same time, has a very positive potential impact on Mexico ´s economy. There are, however, some issues that must be addressed in order for Mexico to successfully climb the global rankings. These issues include the lack of coordination between operators and authorities, as some airports are overused and some are underused. Another main issue is the lack of connectivity out of the airport through logistics' infrastructure, which affects the production-consuming-distribution nodes. Lastly, there is a lack of an adequate airport infrastructure in the main cities, which limits the possibility for Mexico to establish itself as the main center of passenger and cargo connectivity for Latin America.

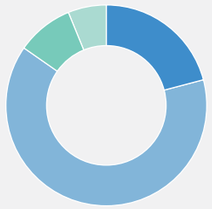
How would you evaluate the aerospace industry's contribution to Mexico in terms of job creation and other relevant benchmarks?
LPD: The aerospace industry is a great source of specialized jobs and economic activities closely linked to the development of new technologies and the advancement of Mexican manufacturing talent. The industry in Mexico generates about 31,000 formal jobs, from which 64.5% are located in the states of Baja California, Chihuahua, and Querétaro. The design of aircraft parts and systems is an everyday-growing market, therefore innovation and the capability of developing value-added products to the aircraft production chain is without a doubt a business opportunity around the globe, strategically positioning Mexico. But, there is still a great deal of work to be carried out, especially considering that according to the government's Pro Aero 2012-2020 plan, Mexico is expected to increase sales, which will bump up its global ranking from its current position at 15th place to 10th place. •

AEROSPACE SURVEY DATA ANALYSIS

PROCESSES LACKING IN MEXICO

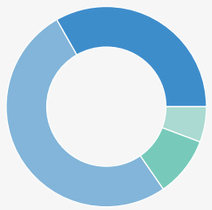


IN COMPARISON TO OTHER SECTORS, DEVELOPING THE AEROSPACE INDUSTRY IS CRITICAL FOR THE ECONOMIC GROWTH OF MY REGION



	%
Strongly agree	21
Agree	64
Disagree	9
Strongly disagree	6

THE LOCAL/STATE GOVERNMENT SHOULD PROVIDE GREATER SUPPORT IN DEVELOPING THE LOCAL SUPPLY CHAIN

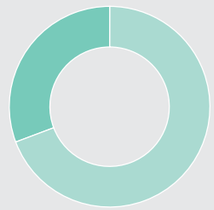


	%
Strongly agree	33.3
Agree	51.5
Disagree	9.1
Strongly disagree	6.1

DO YOU THINK THE TRIPLE HELIX MODEL (COLLABORATION BETWEEN ACADEMIA, INDUSTRY AND GOVERNMENT) IS EFFECTIVE IN YOUR STATE?

	%
Yes	33.3
No	66.7

DO YOU THINK THE TRIPLE HELIX MODEL IS EFFECTIVE NATIONALLY



	%
Yes	69.7
No	30.3

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


EM


FLHU

Eduardo Muñíz & Federico Antonio de la Hoz

EM: Director, Finance, Transport, Logistics and Aerospace
FHU: Head, Aerospace Sector
BANCOMEXT

Can you provide us with a brief introduction into Bancomext?
EM: Bancomext is a development bank in charge of fomenting and financing Mexican 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 financing built-to-suit industrial parks and plants where aerospace companies operate 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 foment 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 remodeling 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 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 by all Mexican airlines. The consumers have benefitted incrementally as the prices keep dropping as a result of increased competition, which has created a real debate about whether to travel by bus or plane.
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 plane, it must buy it with 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 service 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. •

Marcos Rosales Gómez

Director General and CEO
MEXICANA MRO SERVICES

Mexicana MRO Services was a part of Mexicana Airlines until it ceased its operations in 2010. Can you provide us with an introduction to the company as a standalone entity and how it has fared in the last two years?
Mexicana MRO Services was a part of Mexicana Airlines to provide maintenance to its fleet, but beginning in 2007 it also sought opportunities as a third-party provider for other airlines. Today, Mexicana MRO Services offers maintenance and painting through its nine production lines, two of which are dedicated to painting. Our hangar is flexible, allowing us to service wide and narrow bodies. Mexicana MRO had been struggling from grave financial and economic times since its inception, but through disciplinary action and stern decision making by the management team, the company was finally able to be audited in 2014 by PwC, with a quite positive and favorable outlook. Looking forward, 2015 will be completely different to 2014, not in a sense that 2014 was bad, but on the contrary, the difference will come from the fact that there was no financial base of records. Our initial calculations yielded that we had 3.5 production lines per year, but in reality we are actually reaching 5.5 on average as of 2015, which has given us a certain stability. Furthermore, client retention has been a determining factor for our uphill climb, as we are favored by the national clients, and South American clients have stuck with us and are actually growing, since we added four more in 2015.

How does Mexicana MRO plan to continue to expand its domestic and international footprint?
Mexicana MRO has a solid amount of national clients, but our main market is South America. Our eyes are set on European leasing companies, which we increased from one to three this year. The goal is to bet heavily on consolidating business with the Central and South American companies and continue to scout the opportunities in the United States in order to bring their ships to Mexicana MRO. U.S. airlines can choose from a massive supply of maintenance, repair and overhaul (MROs) companies, but the availability and cost of the skilled workforce in Mexico, as well as our own efforts to increase our certifications, will enhance our chances, especially as our operations increase once we move into the new airport.

What competitive advantages differentiate Mexicana MRO from other MROs in Mexico and the region?
The Mexican market is small with only three main players, which give services to third parties, while Aeromexico and Interjet have their own shops. Today, we are the leader in market share, and have established three main factors that will help increase our market share. The first is the flexibility to receive airlines, aided greatly by the engineering team that we inherited from Mexicana and allow the internal logistics to run smoothly. The second is delivery time, and the third is the number of certifications, of which we have sixteen. •

Image: UTC Aerospace Systems

BAJA CALIFORNIA: AN AEROSPACE COMMUNITY 50 YEARS IN THE MAKING

"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 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. "In 2015, we brought $2.5 billion of direct foreign investment 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 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 resources and communication. The only limitation is to cross the physical border."

Image: Gulfstream Aerospace Corp. Mexicali

Mexico

7th

LARGEST

Supplier of aircraft parts to the US

Source: Proméxico

More than

300

companies and support organizations, generating about

45 thousand

jobs

Source: Proméxico

Being able to offer more than just competitive labor rates is in important factor in attracting large players to the State.

Gulfstream, 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 Mexicali 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 Luz 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 interiors 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 progress: "In terms of the engineers, the technical transfer is still challenging and we are still moving towards getting the right systems accessed."

To summarize Baja California certainly owed its initial growth to its proximity to the U.S. and still today benefits from being part of the 'Cali-Baja' mega-region. However, through the strengthening 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 general 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 operating 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 driven by OEMs and not the contract manufacturer," said Rod Gunther, 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 CETYS 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 engineering 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 resources 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 Ardy 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 (CEID), 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 bachelors 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 small metal 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 a two-hour drive from Tijuana. The company now wants to leverage its engineering capabilities in Mexico to find new customers. "We want to work with customers who value our engineering support," said president and CEO Javier Castro.

Baja California possesses important strengths in its human capital and infrastructure. Above all there is a staunch willingness in the state to develop its design and engineering capabilities in aerospace. The challenge now is to discard the stigma of being simply a manufacturing destination by promoting the success stories internationally. Honeywell seeks to do just that and works with ProMéxico to showcase the company's success in design and engineering in Baja California. Baja California's, and Mexico's in general, advances into the fields of design and engineering bring the country a step closer to being a destination that may one day address the full life cycle of an aircraft. •

Carlo Bonfante Olache

Secretary
SECRETARIAT OF ECONOMIC DEVELOPMENT (SEDECO), BAJA CALIFORNIA

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 21% nationwide. Our aerocluster is a diverse set of aerospace companies, from single assembly to those with more complex processes. Companies like Rockwell Collins, Chromalloy, Gulfstream, 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 supportive pro business environment in order for companies to have the confidence to establish here. Therefore SEDECO operates through strategies and processes by which we promote these strengths to encourage foreign investment. In 2015 we brought $2.5 billion of direct foreign investment into the state, and are expecting to increase that figure next year. This will allow us to develop Baja California's competitiveness, and attractiveness for companies to establish themselves here – for example to offer companies a rate for energy that 10% to 20% cheaper than any other state in Mexico. We are also developing training centers in Tijuana and Mexicali, which represents a combined industry effort to create a better labor force. We also work with federal funding offices to determine how companies can qualify for available grants. Finally we operate offices in London, Japan, San Jose and Mexico City, all of which allow us to continue the promotion of Baja California.

How important is Baja California's aerospace industry for both the state and the country?

It is very important for a number of reasons. Most crucially employment, there are 28 000 people employed within the Aerospace industry. Having a vibrant aerospace industry also invites knowledge, and innovation to the area which in effect will help us create a local supply chain, which will in turn help our economy. Currently the percentage of integration that we have on suppliers is from 3% to 4.5%, and by the end of our term we would like that to be 15% to 20%.

What is preventing there being a strong base of local suppliers from growing and how is SEDECO hoping to change that?

Developing a local supply chain takes time. We started by trying to create the employment base. Currently, there is a joint effort between industry, government, and municipal economic development offices to develop more favorable conditions to grow and develop suppliers. We are also working with development banks and international banks to support with the capital required. Furthermore, SEDECO manages the annual Advanced Manufacturing show, which offers a platform for original equipment manufacturers and small and medium-sized enterprises to interact. This year SEDECO is organizing the conference in partnership with BCI Aerospace.

Can you talk about the relationship you have with the two clusters in Baja California and the relationship that they have with each other?

The two clusters, Mexicali and Tijuana, should merge to form one cluster, which is something that I am working on. The reasoning for having one cluster is simple; they would have much more strength and power. This way it will be simpler, and the message will be more representative and valuable for Baja California as a whole.

Looking ahead, how does SEDECO hope to keep Baja California a competitive aerospace hub on an international scale?

In the challenges that we are presented with, we find opportunities for growth. The aerospace industry in Mexico has low local and national supply chain integration, an many of the processes necessitate crossing and international border in order to be completed, as many of the supplies come from outside of Mexico. Even with the possible exemption of import/export taxes, the additional expense, time and logistics implications of such low-integration-level processes open up an obvious question: could the Mexican aerospace sector be more efficient through further supply chain integration? We believe that so. Part of the state's activities is to achieve a better-integrated supply chain, includes seeking opportunities for potential suppliers. Aimed to these efforts, we planned events such as the Advanced Manufacture Meetings in early November at which will be the first one-to-one meetings platform, which connects decision makers with suppliers in the advanced manufacturing and technologies sector.

With the continuation of the National Aerospace and Defense Contractors Accreditation Program and implementation of the BASA, Baja California will likely see growth in the sector. However, competition inside the country is fierce, with other states offering incentives in the form of tax exemptions and reductions, as well as a lower land cost. Nevertheless, Baja California will continue to be a prime location for aerospace, partly due to its history, advances in education/industry, and the availability of a trained workforce. •

Tomas Sibaja

Executive President
AEROSPACE CLUSTER OF BAJA CALIFORNIA

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 Competitive Advantage of Nations and reinforced 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 in close proximity to benefit with suppliers of specialized inputs such as components, machinery, services, and providers of infrastructure - including academia and stakeholders. 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 various 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 California. In the 1960s, Mexico partnered with its northern neighbor, the United States, in its new capacity as the country's supply manufacturing 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 segments 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 California 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 aerospace industry moved into the region solely market-driven by convenience of location. There was no coherent industrial policy specialized per sector showcasing the advantages 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 aerospace companies established in our state have a direct relation with California. Additionally, biculturalism stemming and technical support from such proximate relations has proven especially conducive to continued 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 offered with a value proposition well structured and saleable. For example, while other clusters offer labor, land, and logistics, members of our cluster are actively engaged in collaborative efforts at different levels of production or specific market requirements. We have various cluster-wide initiatives and projects and operate truly as a cluster value shared offer, rather than a generic promotional tool that it is better served for promotional entities or government agencies.

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 require more involvement from the industry in their educational programs. It is not easy to substitute or change global suppliers for our tier-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 maquiladora program, what will be the role of design?
Honeywell MRTC Center is a great example of how Baja California's young talent is being leveraged to incorporate design into the aerospace field. Leyman Engineering is a private firm offering custom-made services in design engineering. Catia and Solid-Works also offer training courses to a young cadre of people interested in offering third-party services 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 articulate our capabilities and strengths to the international market. In this way, we will be better equipped to strategically serve original equipment manufacturers, based on their specific competencies and requirements. The Aerospace Cluster of Baja California should be identified as a tool of global efficiency and expertise in the aerospace sector. •

John Ortega

Vice President and General Manager
GULFSTREAM AEROSPACE CORP. MEXICALI

Can you please introduce us to Gulfstream and provide a brief history of the group's operations in Mexico?
Gulfstream Aerospace Corp. designs, develops, manufactures, markets, services and supports the world's most technologically advanced business-jet aircraft. The company, based in Savannah, Georgia, is a wholly owned subsidiary of General Dynamics. Gulfstream, which has more than 16,000 employees, has built more than 2,400 aircraft for corporations, governments and individuals around the world. In 2014, the company had 150 outfitted customer deliveries. Its backlog at the end of 2014 was $13.23 billion.
Gulfstream began its manufacturing operation in Mexicali, Baja California in 1986. The workforce has doubled in the last 10 years to more than 1,600 employees. The size of the current Gulfstream Mexicali facility is 335,000 square feet (31,123 square meters).
What role does the Mexico facility play for Gulfstream's overall global manufacturing operations?
Gulfstream Mexicali plays a significant role in the manufacturing process for Gulfstream aircraft. 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 (G650/G650ER, G550, G450, G280 and G150).

Could you provide details about the facilities, equipment and certifications that are supporting your Mexican operations?
As mentioned earlier, Gulfstream Mexicali is a manufacturing facility. We do not provide details on the specific equipment used there. However, we would like to note the continuous improvement culture found throughout Gulfstream, perhaps no more so than at Mexicali.
Employee involvement is encouraged along with the incorporation of lean tools and philosophies into ongoing processes at the site: manufacturing, engineering, business-support activities and management.
A culture of continuous improvement empowers all employees to submit ideas that make their job easier, foster a more innovative work environment and transform their abilities, capabilities and knowledge.
In 2004, Mexicali employees submitted more than 500 ideas to improve the site's processes. By 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 manufacturing 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 advantage over other Mexican states in terms of infrastructure (highways connecting Mexico to the United States, major cargo seaports, international airports, railway services and direct border crossing sites, with several ports of entry to the United States).

Can you discuss how Gulfstream collaborates with local academic institutions to support its human resources needs?
Gulfstream Mexicali pays for employees to pursue training and academic degrees at a local college, CETYS Universidad. Employee family members are eligible for CETYS Universidad 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 service in 2018, while the G600 will follow in 2019. •

Ricardo García

Director of Engineering and Technology
HONEYWELL AEROSPACE, MEXICALI RESEARCH AND TECHNOLOGY CENTER

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: aerospace, automation and control solutions, and performance materials and technologies. 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 a 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 for 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. Respectively, these states are hubs for engines and auxiliary power units, and environmental control systems. A third reason would be the synergies and collaboration that we could 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 Mexico 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 Airbus' customers. 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 components systems for this platform. Once we started moving into the development stage, our systems integration laboratory (SIL) was a key enabler for a smooth and successful testing campaign for the A350. The SIL is a test bench where we received several components and systems that go into the A350, not only from Honeywell sites, but also directly from Airbus and other Airbus suppliers. We brought all those systems together in a lab under a controlled environment and made sure that all were going to work as one single cohesive system. In doing this we were able to proactively identify the required design changes to Honeywell and Airbus products. This is the first time that a tier-one supplier had done this for the aerospace industry. MRTC is a one-of-a-kind facility across the global aerospace footprint.

How do collaborate with local universities to foster the talent pool?
When we opened in 2007, 70% to 80% of our employees were from cities like Guadalajara, Querétaro, Mexico City, and Monterrey because these were cities that were home to the talent that we were looking for. Unfortunately we found retention difficult. We therefore began to work with local universities to build a curriculum aligned with our needs and so be able to source engineers locally. With CETYS University, we created a master's degree in aerospace engineering and at UABC we helped launch an aerospace bachelor's degree. We have also embarked on a joint venture with the latter to create a materials laboratory.

What obstacles prevent Mexico from shifting from a manufacturing hub to a destination for engineering?
It is a combination of several factors. Mexico has still to discard its stigma of being simply a manufacturing destination, which is perpetuated to a certain extent by the maquiladora environment. There is also still international skepticism as to whether Mexico has everything that a company needs to establish an engineering-oriented operation.

Do you have a final message?
It is evident that Honeywell Aerospace and Honeywell in general has been successful in Mexico and in Baja California. The country possesses three important strengths: a wealth of young talent, good infrastructure, and above all a communal willingness to progress. The challenge that needs to be addressed is supply chain development, which can only be overcome if a collaborative effort is made. There are high-entry costs for a local company to be considered a viable supplier to the aerospace industry. What is lacking at the moment is a long-term strategy. The government should not attract companies simply because they are aerospace companies. Rather they should have a clear idea of what Mexico can offer and tailor their approach to companies that match this strategy. Once this is done, there is no doubt that Mexico will succeed as a key player on the international aerospace stage. •

Ardy Najafian

General Manager
GKN AEROSPACE ENGINE SYSTEMS, MEXICALI

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 with 61 sites in 15 countries on three continents. GKN has over 30 years of experience of operating in Mexico though our automotive facilities in Celaya. Our aerospace footprint in Mexico includes four sites across three states. Two sites are in Mexicali, one in San Luis Potosi, and one in Chihuahua. Our Mexicali metallic 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 came 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 competitive quality in Mexico in comparison with our main facility in El Cajon California. Our first site was a 20,000-square-foot building with five machines and 15 people. Early on, it was clear that the quality coming out of this facility was very much comparable to what was being produced in the United States. Therefore, we began to ramp up business by adding more machines, products, and machinists/engineers. I was brought on as general manager in 2005, and my first task for the site was to obtain AS9100 certification, which we achieved in 2006. As business grew, we expanded our facility to 45,000 square feet. At this point we were producing enough parts at the right quality and competitive price that we became a significant strategic site for GKN Aerospace Engine System's division. In 2008, based on our track record and the division's strategic plans, we expanded to a new 155,000-square-foot facility in the industrial park PIMSA. Over the years we have transferred more products that fit our strategy and processes from our North American operations and have achieved our growth expectations year-over-year.

What strategic advantages did Mexicali offer over other aerospace clusters in Mexico?
Before selecting Mexicali we explored several other regions in Mexico, but eventually settled on Baja California, as it was closest to our operations in San Diego. The city of Mexicali was chosen over Tijuana for two reasons. The first was the ease of logistics. Even though Mexicali is further away from San Diego, the ease of border crossing and better infrastructure offered a faster and more secure means of transporting our products. The parts that we manufacture are very large and extremely expensive so this was important. The second reason is that the workforce is more stable in Mexicali than other border towns within our region. We examined that Tijuana due to its fine location and friendly climate has a tendency to cater to a more transient and touristic population, which was a concern for us. Finally, despite the city's large size, there is excellent business communication between the industry, government, academia, and support organizations.

Can you provide an overview of some of the projects that GKN Aerospace in Mexicali is currently working on?
We are playing an important role in a number of new aircraft and engine programs under development. Our military and commercial portfolio is well balanced and we are on all the right programs with future growth such as 787, 747-8, 737Max, 777X, A320NEO, A350XWB, A380 and F35-Joint Strike Fighter. Our current products also support programs such as 767/777/A320/A330/F15/F16/V22/F22 amongst others.

Do you have a final message?
We consider GKN Aerospace operations in Mexico a very successful story and continue to leverage opportunities and invest here. However, being successful in Mexico requires a good knowledge base of all dynamics revolving around the availability and sustainability of qualified and trained resources. It also demands investment in understanding the local culture, language, training, coaching, and sharing knowledge along with being able to leverage available support systems within Mexico to create your own recipe of success. The most challenging issue for the industry's growth in the next decade will be how industry, government, and academia join forces to create the infrastructure and ecosystem to supply the required resources for the demand of our industry and its local suppliers. •

Tad Shiner

President and CEO
HUTCHINSON AEROSPACE AND INDUSTRY, MEXICO

Can you give us an overview of Hutchinson's operations in Mexico and the role this facility is playing?
Hutchinson is of part of the French oil company, TOTAL SA Oil. There are three Hutchinson sites in Mexico, but this is the only one focused on aerospace operations. The four main groups of products within Hutchinson aerospace are thermal insulation, fabric, mechanical sealing systems, and structures. Our facility in Ensenada is AS9100- and NADCAP-certified, with customer approvals including Bombardier, Boeing, GE, Honeywell, Triumph, UTC and Gulfstream. What separates us from other maquiladoras in Baja California is that we are completely self-contained, including design and development of new products. This facility has seen substantial growth over the past three years, and we expect to double in size again over the next two years and our product line to grow by 300%. We are developing projects that are being designed internally here. Currently our facility is 90,000 square feet, with a staff of 330.

Does the Mexican aerospace market present an opportunity for growth?
The majority of our products are exported to the United States, but we have on-going projects with Eaton Aerospace in Tijuana and SNECMA in Querétaro. These projects are in support of Boeing and Airbus aircraft.

How have you found the process of product transfer?
This process certainly has its challenges, as with any transfer projects. We have two teams in Mexico and Europe that coordinate the transfer activities and requirements. We also involve the customer and make sure there is constant dialogue between all three parties. Once that communication is in place, we can begin the process of developing the right plan based on customer requirements from Europe to our Mexico factory. We are currently working on a product for the Boeing 737 MAX that was developed in Europe with the help our Mexican design team and is now in the beginning phase of transfer to Ensenada.

How have you incorporated design into your operations in Mexico?
This is something that we had to develop because it did not exist in our organization. Our engineering team has become successful and stronger over the last ten years This is something that takes time, and I am proud of the team that we have created. As part of this process, we have sent our Mexican engineers to Europe to gain experience and bring the knowledge back to Ensenada.
Most of our customers support this transfer, and we have not encountered much resistance in bringing design into Mexico. They have found it favorable to be dealing with someone in the same time zone. Most of our engineers speak English, which is a requirement to do business with U.S. engineers.

How have you worked to develop the young talent in the area?
Hutchinson is working with local universities in Northern Baja to find talented engineering students who are skilled on CAD systems. We have developed a program that starts these engineers as 'interns' and ultimately hire the best qualified. It is important to note again that our engineering team members are as bright and talented as any engineers I have worked with during my career.

Do you see Ensenada playing a more prominent role in Baja California's aerospace industry?
Ensenada needs to do more to promote itself to be recognized alongside Tijuana and Mexicali, and we are working with the Baja California Aerospace Cluster to achieve this as well as attending crucial events. There are many opportunities for companies here, and the available talent is a significant strength of the area.

What is your strategy for achieving your projected 100% growth over the next two years?
Winning new programs will be key, including products used on the new Boeing, Airbus, Gulfstream, and Bombardier aircraft. This will help us achieve the high goals we have set ourselves. There is still a vast amount of opportunity in the United States that we can benefit from.

Do you have a final message for our readers?
It is an exciting time for Hutchinson aerospace in Mexico. We are just at the beginning of our five-year plan and are set to make a considerable contribution to Baja California's aerospace industry. We have tapped into the hugely talented human resources 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 United States or Europe. •


RC


BJ


SS

Roberto Corral, Bill Jordan & Sergio Segura

RC: General Manager
BJ: Operations Manager
SS: Quality Manager
INNOCENTRO LLC

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 galleys themselves. The aerospace industry is moving towards lighter and more convenient 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 specialty 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 Ingeniom.
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 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 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 Ingeniom 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 evolve our own branding. The strategy for 2016 to 2017 is related to our interiors repair/assembly cell. Innocentro will have a strategic alliance with a company in Singapore and will interchange our two companies' expertise. From there on, Innocentro will build a shop in Mexico, of which part will be a repair station.
A repair station is an airworthy, caged area authorized by the Federal Aviation Authorities (FAA) through Mexican authorities, which is called DGAC. The authorization can take as long as six to nine months and is very costly. It is worth having a repair station as Innocentro will then have the authority to repair different parts of aircrafts in regards to interiors. Innocentro believes that repairs will be growing at a very fast rate, as the slowdown in the economy is making people hesitate to buy new equipment.

In terms of research and development, what are some of the major trends Innocentro is working towards?
SS: One of the major challenges that Innocentro has experienced over the last 10 years is the change in the market. The market has constantly been evolving bringing in newer materials and certifications. Operating in a non-FAA country, Innocentro had to be able to adapt our processes as to comply with new requirements.
Innovation is very important in the aerospace industry. Currently everything is pointing to passenger experience. Innocentro wants to keep up with the trends as to meet all the needs and requirements of our customers. We want to prove how a small agency can satisfy the end user experience with our services. This can be proven by reducing weight, costs and engineering time while still delivering quality products and services. Innocentro tries to keep up with trends and we are constantly being innovative. The aerospace sector in Mexico is conducive for design.

What are some of the key strengths that Mexicali offers as a destination for the aerospace sector?
BJ: In this city, people like to work and want to work as to improve their lives. Due to this the 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.
RC: Mexicali and Tijuana both have specializations that have paved the way for the aerospace industry over the 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 your observations 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 come. Over 95% of supplies are still imported. If we want Mexico to grow a localized supply base, it has to be driven by the large OEMs and tier-one companies. •

Dr. Fernando León García

President
CETYS UNIVERSITY

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 only 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.

Image: CETYS - Center of Excellence in Competitiveness and Entrepreneurship

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

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. •

DEVELOPING BAJA CALIFORNIA'S LOCAL SUPPLY CHAIN

Image: Goodrich, Riquelme y Asociados (Goodrich)

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. Solis 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 it 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. Ardy Najafian, president of the Aerospace Alliance of Baja California, a non-profit civil association that represents Mexicali 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." •

Eduardo Solis

Sourcing/Global Offset Manager
EATON AEROSPACE

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 sixty percent of Eaton's business is in electrical components/solutions and the rest in the industrial business. The latter is divided into three pillars: automotive, hydraulics and finally aerospace, which accounts for $1.9 billion of our overall business. Eaton is defining itself as a provider of system solutions to our aerospace customers. Those solutions fall into four main areas: hydraulic systems, fuel and inerting systems, motion 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 one dedicated to the aerospace business. The operation was started in 2006, is in a 282,000-square feet 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 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 $6.4 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 manufacturers (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 technicians in fields like CNC-programing, welding, composites, airframe assembly, complex assemblies, quality inspectors, chemical processing, thermal processing, etc. is critical 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 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 significantly localizing 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 implies not only the machines and technology, but also having the technical talent to be able to develop multiple part numbers. 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 AS9100 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 sustainable.
Eaton is active in encouraging the growth of SMEs in Mexico not only for its own needs, but also to ensure that the industry increases its competitiveness. We have a good success story with Barry Avenue Plating from Los Angeles and BAP Aerospace de 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 embracing this NADCAP accredited company, 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 customer to BAP Aerospace de Mexico. •

Loren Engel

General Manager
GKN AEROSPACE COMPOSITE STRUCTURES

Can you give a brief introduction to GKN and the company's operations in Mexico?
GKN is a British firm that was established in 1959. Over the decades the company has transformed itself into four primary businesses. The largest component of GKN is the automotive business with the aerospace component being the second largest. As of 2014, aerospace makes up 30% of GKN's revenue. Within GKN aerospace there are different divisions including aero structures, engine products and special products. The company has a presence all over the world, but is predominantly in Europe and North America.
Within aero structures North America, there is a business unit called advanced composite structures. The corporate office for this business unit is in Tallassee, Alabama and until 2012 it was the only site within the advanced composite structures group. There have been four location additions and currently there are five sites within the group. The site in Mexicali was established in 2012.
The Mexicali site was strategically established to be a competitive enabler for GKN aerospace. The aim was also to help the original equipment manufacturers in their pursuit of the Mexican market in providing off set credit to these companies. Currently, the Mexicali site is qualified for doing defense work and most of the work being done is U.S. military work.

Can you elaborate on GKN's facility, the equipment, and the certifications that the company has?
In terms of the physical facility, GKN has 80,000 square feet that the company leases on a long-term basis. Before the facility was started, a workshop with the landlord and the contractor was held as to determine the requirements for the site. Within two days, the site was laid out, and the company decided to lease the whole 80,000 square feet and grow into the space in two phases.
In terms of certifications, the first priority was to get ISO 9000 and AS 9100 certifications. GKN earned these in 2013. As of March 2015, the company also has NADCAP certification, which is very important in any aerospace business, especially in composites. Earning certifications are dependent on a strong team environment. GKN Mexicali has a significant amount of support from our Alabama parent site, both in terms of quality and engineering and insuring that we have our processes under control. GKN has also recruited a very experienced leadership team in Mexicali, which includes an operations manager, engineering and quality manager and a program manager.

What are some of the key advantages GKN identified in Mexicali before establishing a facility?
The cost structure was the key consideration. The lower cost structure enables GKN to improve its profit margins on existing products and provides a competitive enabler for pursuing new business. Mexicali offers opportunities to GKN as the company can leverage the cost structure here to lower the average cost and be competitive. The location was also a very important consideration, and Mexicali is perfect as it is right across the border. The stability of the city in terms of lower crime rates and the strong work force is also an advantage.

Can you elaborate on the strategy of knowledge and technical transfer that GKN has undergone and how successful this strategy has been?
GKN has a lean operation in terms of indirect to direct. The company has 110 employees and only 15% of the employees is on salary or indirect. The transfer of knowledge has been largely from the technical staff in Alabama in terms of supporting and training in product and process knowledge. This transfer of manufacturing know-how in order to successfully build product has been very successful. One area that has been a challenge for us is providing our engineering staff with the access to technical data in GKN systems that they need to do their jobs. The issue has been how to give our engineers access to the data for which we have export licenses in place while preventing access to data for customers and product for which we do not have licenses. GKN is in the process of testing an ITAR compliant version of our MRP system that will allow the company to have better technology transfer to our engineering staff.

Does GKN source supplies locally?
To this point, local sourcing has been limited to operating supplies. The raw materials are all imported from the United States. GKN wants to develop local suppliers for non-destructive testing, CNC machining and tooling, as outsourcing these services to U.S. companies is difficult and expensive. Finding local suppliers can sometimes be difficult in Mexicali, but there are opportunities for suppliers to enter the local markets. The government is also running programs to encourage them.

Do you have a final message?
What I like about doing business in Mexico is that what you see is what you get; business relationships are very transparent. GKN Composite Structures is happy to be in Mexico and is ready to serve our customers' aerospace composites needs. •

Rod Gunther

General Manager
BENCHMARK ELECTRONICS INC.

Please provide a brief overview of Benchmark Electronics' operations in Mexico.
Benchmark Electronics Tijuana was formed in 1985; it was a spin-off from Sperry Flight Systems, which was then acquired by Honeywell, which, in turn, transferred its manufacturing operations to a contract manufacturer in 1999. Our manufacturing operation was acquired by Benchmark Electronics in 2013. Benchmark's service offering in avionics includes: box build, Circuit Card Assemblies, cables; and harnesses. We manufacture circuit card assemblies (CCAs) subassemblies, box build, and very large scale integration in our Tijuana facility. Our experience in Aviation ranges from electronics found in the avionics bay, cockpit, cabin, engine and actuators for the surfaces of aircraft. Worldwide, almost every commercial aircraft contains a Benchmark Electronics product.

Why did Benchmark acquire the Tijuana site?
Benchmark desired to have a northern Mexico presence to complement its central Mexico facility in Guadalajara. Since Benchmark focuses on high reliability markets, the 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 support services from your Mexico facility?
The company's facility in Tijuana is 107,000 square feet, with 525 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 9k2k; 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 525 employees. Equipment includes: seven surface-mount technology lines; 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 9k2k; 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 aileron, 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 strengths that Baja California offers as a hub for aerospace?
The biggest challenge is the thought-pattern shift of aerospace companies in United States that the low-cost region of Tijuana is a good destination to source products for original equipment manufacturers (OEMs). 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 25 years; its avionics business surged 12 to 15 years ago upon the introduction in 1997 of the North American Free Trade Agreement. This agreement initiated steady jobs in Mexico giving parents the financial stability to send the next generation to college, resulting in a plethora of four-year degree students from Baja California in engineering and international business. In the last 10 years, Tijuana's infrastructure has markedly improved.

Is the supply chain of small- and medium-sized enterprises adequate for Tijuana's aerospace industry?
Many of Benchmark's parts are sourced from United States and Asia. It has been working on localizing its supply chain in sheet metal and plastics, although many OEMs select their own materials. The company's daily needs are contracted locally, e.g. stencils for SMT assembly equipment; benches; and maintenance, repair and overhaul supplies. There are some special process gaps that are being addressed in the supply chain locally, and will be filled in the next few years.

What is your involvement with research and development (R&D) and are you incorporating automation?
Our involvement in R&D will be with our approximately 300 design engineers located around the globe. While we will work with our customers to assist them in these areas, we are focused on the product realization side of the business at the site level.
We are fortunate to have some of the best automation engineering available. We incorporate automation and semi-automation in the process where is makes reasonable and financial sense based upon the complexity and volume of the task.

What goals do you have for the next five years?
Benchmark will grow its facility and capabilities within the Tijuana area with anticipated growth in mid-double digits year-over-year. U.S. and European OEMs want to continue moving product to a high-talent, low-cost region area, and Mexico provides a better total cost of ownership than many of the Asia-sourcing decisions that were made a number of years ago. •

Joaquín Jiménez

Director of Innovation and Government Affairs
SKYWORKS SOLUTIONS DE MÉXICO S. DE R.L. DE C.V.

Can you introduce us to Skyworks Solutions?
Skyworks Solutions, Inc. is empowering the wireless networking revolution. Our highly innovative analog semiconductors are linking people, places and things spanning a number of new and previously unimagined applications within the automotive, broadband, cellular infrastructure, connected home, industrial, medical, military, smartphone, tablet and wearable markets. Headquartered in Woburn, Massachusetts, Skyworks is a global company with engineering, marketing, operations, sales, and service facilities located throughout Asia, Europe and North America.

Can you talk about the importance of the Mexicali facility to Skyworks' global operations?
Skyworks' Mexicali facility provides assembly, test and finishing services for a wide portfolio of semiconductor solutions. Mexicali is the largest manufacturer of multichip models and Skyworks is the largest supplier worldwide. Our assembly capacity is almost 9 million units a day and test capability is 12 million units a day. We operate in a 360,000 square foot facility and are certified to ISO 9000, ISO 14000 and the TS 4969. 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 to reduce cost and increase productivity. From fiscal year 2011 to fiscal year 2014, we increased our capacity by 145% and saved $20 million through cost-saving initiatives.

How 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 Mexicali, 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. Linkage activities will ultimately 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 they will have the choice to stay on in full time employment with the company. We currently have 26 students with us as part of this scheme and another 25 on what is called social services required 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 Skyworks center of innovation (CISEM) in Mexicali. This was in response to study we conducted that showed that the work that was being undertaken in universities across 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 agencies to establish what the next 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 tune with the current thoughts and needs of 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 guidance and efficient knowledge transfer, Mexico's aerospace industry could be competitive internationally. What is 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 automotive, broadband, cellular infrastructure, connected home, industrial, medical, aerospace, smartphone, tablet 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. This is one of Mexico's greatest strengths and what the international aerospace community needs to know. •

Roberto Buelna

General Manager
ORCON CORP., ENSENADA

cility in Mexico. Over the years, Orcon has brought more and more production lines into this facility and currently more than 90% of the whole corporation's production is being done in Mexico.

Can you elaborate on the size, operations and workforce of the Mexico facility?
The facility in Mexico is approximately 45,000 square feet. The labor pool fluctuates from 50 employees to up to 350 employees, depending on the contracts in place. Currently Orcon has a minimum amount of labor force and employs about 40 people.

Is Orcon under the maquiladora program?
Since the beginning of Orcon's operations in Mexico, the company has been under the maquiladora program. The company operates on a twin plan. This means that Orcon has a facility in Ensenada and also a warehouse facility in the United States right across the border from Tijuana. The warehouse facility serves as a buffer for inventory and also does the logistics for shipping worldwide. As per the maquiladora regulations, Orcon ships all of our products from the warehouse in the United States.

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 over the 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 on some lean initiatives. 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 company's and the employees' daily goals. Orcon also makes sure that its staff knows and understands 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. Aircrafts can only have products incorporated that have been preapproved. Orcon has a different market, as the company sells not only to OEMs but also to the maintenance, repair and overhaul (MRO) companies. One of Orcon's biggest customers is the MRO business and operators.

When did design start to play a larger role in Orcon's operations in Mexico?
Design started to play a role when Orcon started developing supplemental type certificate (STC) packages especially for the aftermarket. The company saw the necessity for STC packages so as to reduce the cost of maintenance on aircrafts for the operators. This was an opportunity for design for Orcon, and we integrated engineers from the corporate office into the Mexico facility. The engineers train Orcon's workforce in Mexico on the use of software.

What are Orcon's main goals for the future?
Orcon would like to bring more product lines to Ensenada. Orcon is also looking for opportunities to grow its business in commodities and in services. Baja California currently offers the best opportunities for the aerospace industry. •

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 patents, especially on reinforcing materials to be used on the general acoustic insolation of aircrafts. Orcon then gained a market in the film industry. Film is the material that is used to fabricate insolation blankets.
As the business started to grow, Orcon had a strategic plan to move into Mexico, as it was a lower-cost country than the United States. In 2003, the company established its first manufacturing facility outside of the United States. At that time it was the perfect opportunity for Orcon to start producing in Mexico as the company won a big military contract. In the Mexico facility, Orcon manufactured 95% of the insolation of cargo military aircrafts. The company then also started to acquire retrofit business for a big U.S. operator. This project was done through the fa-

Javier Castro

President & CEO
BAZZ HOUSTON CO.

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 to 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 also offer substantial design and engineering support. We are looking for customers with strong research and development that are constantly developing new products, and as such need support from a design for manufacturability perspective. This is where our engineering team can add significant value.

Are you able to provide a case study of a recent engineering project Bazz Houston undertook with a customer?
We have a customer based in Sonora who had a product that was maturing. We were producing about seven million assemblies for them per year, but cost was becoming an issue. Our engineering group was able to develop a new design eliminating the requirement for high-strength, low-alloy material, reduce the material thickness by 20%, while maintaining the structural strength required for the application. Our team was able to reduce cost and generate savings to the customer of over $1 million per year, for which it 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 foreign supplier over developing a local one?
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 company takes much more time 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 considered partnering with some of our sources in the United States to help develop this service offering in Mexico, which is still in the discussion stage. The two main factors that are currently preventing companies from expanding into Mexico are a lack of understanding of the business community and the language barrier. It is very important that U.S. suppliers realize the potential in Mexico and expand now while the opportunities are great.

Do you have a final message?
Bazz Houston will continue to expand the range of its services in Mexico while further developing its local engineering resources. Our experience in Mexico has been very positive and, without a doubt, had we not expanded here ten years ago our company would not have experienced the significant growth that it has. The international aerospace community needs to share the successes that companies such as Bazz Houston have experienced in Mexico, and continue to encourage suppliers to invest in Mexico. •

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 service 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 California. Strategically, this complements our current manufacturing capabilities and is a need that our customers have been asking for. This will also strengthen our efforts to

Monty Merkin

CEO
MTI DE BAJA INC.

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, contacts from my aerospace 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 brought in its first aerospace customer in 2006. The owner of the machine shop soon wanted to get out, and MTI made the decision to buy the business and bring the machining capabilities in-house. It took three years for us to be able to master this business and get to a point that we were providing the high-quality and on-time delivery demanded by the aerospace industry. In 2010 the fabrication business was acquired by 3M, at which time we pulled the machine shop out, relocated it, and became the company we are today.

What is the full scope of capabilities and services MTI de Baja is able to offer today?
Our core competency remains in machining. MTI de Baja can also offer sheet-metal fabrication, injection molding, wire-harness and cable assembly services. What has transformed our business is establishing a supply network of our own. We work with a number of what we term 'operating partners' that are essentially world-class manufacturers with excess capacity. MTI de Baja can take over this excess capacity and use it to manage additional products from inception to final delivery.

How important is the aerospace industry for MTI de Baja?
Ninety percent of our business comes from tier-two and tier-three companies, though in the past we have also worked with tier-one companies and even some original equipment manufacturers. The industry is extremely important for MTI de Baja and accounts for 80% of its total business.

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 AS9100 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 continuous compliance. We engage in failure-mode analysis and carry out risk 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.

What is MTI de Baja's strategy for sourcing and training its personnel?
MTI de Baja provides full in-house training and cross trains its entire staff. This means that all personnel are familiar with every aspect of our production process. Due to the limited availability of machinists in Ensenada, MTI de Baja has created a system in which it can employ someone with no experience and take them through a step-by-step training program to a point where they can operate a machine. MTI de Baja has almost no turnover because we provide our staff with a career rather than a job.

What are some of the strengths that Ensenada offers aerospace companies over nearby Tijuana and Mexicali?
Ensenada has one of the highest education rates per capita in all of Mexico and as such the labor pool is strong. It is also one of the safest cities in Mexico. Additionally, unlike in Tijuana, one does not encounter employee poaching. Therefore, we are able to invest in our employees with confidence and help build their careers and expertise while we build our business.

How have you seen Ensenada evolve as an aerospace hub and what role is the region playing for Baja California's aerospace as a whole?
Despite the presence of Hutchinson and Orcon, I have not seen considerable growth in Ensenada as an aerospace hub in the past years. MTI de Baja, however, has stimulated growth to a certain extent. Not only have we grown as a business, but also we have established a supply network in the area that we continue to develop and utilize. This created jobs and has contributed to the growth of the aerospace sector of the region's economy.

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 continue to grow 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 a consolidation process of incorporating similar businesses into our own to create a larger operation. We are one of largest machine shops in the region, but through an even larger operation we want to be able companies more of a one stop shop with multiple capabilities under one roof including secondary processes. The quality, service, and delivery in Mexico can be equal to or greater than in any other part of the world. The key to that is finding the right partner to work with. •

Bill Castaneda

Vice President, Business Development
AMERICAN AUTOCLAVE CO.

Can you give 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 new generation of airplanes is heavily reliant on autoclaves, as 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 manufacturing facilities in the United States, of which the main facility is in Georgia, one facility in England, 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 opportunities American Autoclave identified in the country?
American Autoclave in Mexico was set up in August 2015, as it identified many business opportunities in Mexicali. Mexicali 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 main reasons that several companies expanded into Mexicali were that labor is significantly more economical than in the United States, and the workforce is talented. There are several academic institutions in the area that produce good technically qualified people.

Can you provide more detail about the autoclave itself and how its role has evolved in the aerospace industry as composites have 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.

Do you think that all original equipment manufacturers (OEMs) and tier-one companies will have some form of autoclave in their operations?
The industry is definitely moving towards a space where OEMs are starting to incorporate autoclaves as part of their operations. American Autoclave expanded its operations into Mexico as the demand for autoclaves in the aerospace industry is exponentially increasing and there is a large need for equipment in this region.

What are the post-sale requirements of companies in Mexico and what are the post-sale services that American Autoclave can offer?
One of the requirements in the near future will be that American Autoclave will have to manufacture autoclaves in Mexico. There will be a manufacturing facility in Mexico and the autoclaves will have all the certifications and technologies that are required. In terms of regulations, Boeing has requirements for processing an autoclave for the manufacturing of composites just as the Airbus has the AMS2750 regulations. These are international requirements and one has to comply with these certifications when manufacturing parts for Boeing or Airbus.
American Autoclave also provides 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. The company is based 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 a 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 over the next five years?
American Autoclave aims to have its manufacturing operation established in 2016. We will, however, not only be focusing on Mexicali, as we are looking to set up in Querétaro in the future. There are several aerospace companies in Querétaro, but they are not doing aero-structure manufacturing yet. There are many prospects in Querétaro and, as the 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 Mexicali 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, experience, and quality, Mexicali is the region to invest in. •

Cruz Maldonado

President
BAP AEROSPACE DE MEXICO, A BARRY AVENUE PLATING CO.

Can you give a brief overview of Barry Avenue Plating Co. and the firm's history?
Barry Avenue Plating Co. was established in Los Angeles (LA) in 1947 and is a family-owned business. Currently the company has 120 staff members working on two shifts. Barry Avenue Plating Co. has approvals from all major original equipment manufacturers (OEMs) and offers over 55 finishes, all of which are NADCAP-certified. Out of our Los Angeles facility, the company services more than 3,000 active customers.
Barry Avenue Plating Co. and BAP Aerospace de Mexico are known for their quality, customer service, and fair pricing. We also try to establish close relationships with our customers and develop new projects together. Innovation is important, and the company strives to develop new finishes and tooling that our customers may require. Both Barry Avenue Plating Co. and BAP Aerospace de Mexico can be seen as a strategic partner rather than merely a service provider.

Can you elaborate on what led to the move to Mexico and what the process entailed?
Barry Avenue Plating Co. has been in partnership with Parker Hannifin for over 50 years. Parker Hannifin moved into Tijuana about 20 years ago and since then had been asking Barry Avenue Plating Co. to also move. As the aerospace industry in Mexico started to grow and more customers moved to Mexico, Barry Avenue Plating Co. started to look into migrating.
Eaton Aerospace had a big influence on the company's decision to migrate to Mexico. We were a key player in helping Eaton Aerospace move big projects into Tijuana and support their needs. So, as to continue supporting our client's needs in Mexico, we decided to open a facility in the country. The decision was made easy by the base line of customers that Barry Avenue Plating Co. already had in the region and the relationships we had with these companies. We were also guaranteed business as the company has been in the industry for many years. Having many aerospace customers also gave us the advantage of knowing upcoming developments and new projects. The reputation and experience gained by Barry Avenue Plating Co. in LA helped establish the market in Mexico and create BAP Aerospace de Mexico.

Can you elaborate more on the facility in Mexico and what industries it serves?
BAP Aerospace de Mexico was based on NADCAP requirements, as it wanted to target the aerospace industry. Currently 60% to 70% of the company in Mexico is involved in the aerospace sector. BAP Aerospace de Mexico's high quality services and fair pricing also make us an attractive option for the medical and automotive industries in Mexico. All of BAP Aerospace de Mexico's finishes are done according to the aerospace NADCAP requirements.

Were there any concerns that customers in Tijuana would be reluctant to accept services from a new facility in Mexico?
There were not many concerns as Barry Avenue Plating Co. is a widely known name and has a reputation of delivering high-quality services. However, we had to fight the idea that in Mexico everything is cheaper and therefore the quality is worse. BAP Aerospace de Mexico proved to its customers that its services in the Mexico facility are of same quality as in its LA facility. We have had companies that wanted to do a three- to four-day audit on the Mexico facility, and in less than one day the audit was completed with full approval.

In terms of technology and knowledge transfer, can you highlight some of the steps and key challenges that Barry Avenue Plating Co. faced during the migration process?
What is most important is to work closely with our current staff to share our know-how on BAP Aerospace de Mexico's quality requirements. One challenge that we came across is that we had to de-train our staff on what they are used to doing locally and re-train them in our NADCAP quality processes. Most processes involve five to six steps. We train our staff to acquire the knowledge and processes by teaching them exactly each step needed to reach the quality required. Training starts with our quality and laboratory personnel.

In Baja California there is a need for a stable and certified supply base as to support the OEMs and tier-one companies. What needs to be done for more companies to serve the aerospace industry in Mexico?
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 incentivize companies to invest. A second challenge is the long process involved with gaining certification and customer approvals.

What goals does 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. •

Bill Jordan

CEO
ALLIED TOOL & DIE

Can you give an overview of the history of Allied Tool & Die?
Allied Tool & Die was established in 1951 and it was originally a family-owned tool and die shop. Within the first year the company decided to change and go into production. Allied Tool & Die then grew and evolved into a machining and stamping company. In the 1980s, the company also started to do laser work and in the 1990s it became more involved in CNC machining, as it got more popular. In 2010, we opened a small production facility in Mexicali.
All the divisions of the company, which include lasers, CNC machining and welding, have grown significantly over the years. ISO certification first came out in 1997 and Allied Tool & Die's first registration audit 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 had machines available and a client with a potential demand.
In 2008, Allied Tool & Die made the decision to look into Mexico. As the company is a contract manufacturer, we needed to have a contract of a certain dollar amount to justify such a large investment. We then collaborated with Honeywell as to secure enough business to make the move to Mexico beneficial. The company officially opened a 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 the company offers in Phoenix, Arizona. The facility in Mexico has CNC machining, which includes 3- and 4-axis mills and lathes. Cutting, bending, forming and welding can also be done in this facility. Both of its facilities are ISO- and AS 9100-certified.

From where 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 purchases is very low and thus local suppliers cannot compete with prices in the United States. There have been several people opening distributing locations in Mexicali, but they do not yet meet our material needs. Allied Tool & Die is able to work with all materials and specialize in high-temperature alloys.

How does the company source human capital and is there sufficient linkage between academia and the aerospace industry?
Currently the company in Mexicali consists of 11 employees. When it came to Mexico, the company chose to operate through a shelter system. Due to the fact that the plant in Mexicali is small and would take time to grow, a shelter program made the most sense economically.
There is a good linkage between academia and the industry as institutions are beginning to provide industry-specific programs. Currently, three of the company's employees are taking classes at local academic institutions to further their knowledge. However, Allied Tool & Die does provide internal training, as we like to promote from within. The company's average employee tenure is over eight years.

What are some of the challenges that are preventing companies from entering the Mexican industry?
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 in Mexico, the original equipment manufacturers have to drive it and offer the support needed.
We received a lot of support from the shelter provider that we pay to help the company operate in Mexico. The government support 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 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. •

Roberto Limón

President
ANODIMEX DE MEXICO, S. DE R.L. DE C.V.

Can you provide a brief history of Anodimex and any recent major milestones?
Anodimex is special-process company offering a range of anodizing services to the aerospace industry. We started as small, family-owned business with only three people. Today, we have grown to a staff of 20 and are able to boast having obtained both the ISO and NADCAP certifications. Beyond those certifications, we also have customer approval from Gulfstream and are currently in the process of obtaining approval from Boeing.

What specific services do you offer to the aerospace industry?
Our core competency is in anodizing. We offer all types of anodizing, those being types I, II and III. Type I is chromic anodizing, which allows companies to weld or adhere cloth into aluminum to prevent separation. Type II is a corrosion preventative and type III is hard anodizing. We are also a provider of electroless nickel plating and we also do some chem film, a process which prevents corrosion, but also allows the customer to then paint over the metal as it lends a good adhesion to the paint. 90% of our business is focused on the aerospace sector and, as such, aluminum is the most common metal we work with. All our equipment is in sequence and operated manually. Everything is monitored extremely closely and we have a laboratory that is also NADCAP-certified to support our analyses of chemicals. The NADCAP certification requires that all of our equipment is centrally controlled and monitored, for which we use top of the range software.

Can you talk through the process of achieving NADCAP certification?
Achieving this certificate was a very long process. It became apparent that in order for us to be successful in the aeronautics sector, we must have all the necessary accreditation. In 2000 the NADCAP certificate started becoming more and more enforced in the aerospace industry, it had been the same case previously 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 within the industry in Mexico as to what these exactly 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 we could perform this to a NADCAP standard. 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 records 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 have 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 SMEs hoping to break into the aerospace supply chain. Today a large corporation will immediately turn down a supplier offering their services should they not have the required accreditation. In order for there to be a sustainable aerospace industry in this region, original equipment manufacturers, tier-one and tier-two companies must do more to aid SMEs to integrate themselves as suppliers. 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. •

Guillermo González

Plant Manager
PLATINADORA BAJA

Can you give a brief history of Platinadora Baja and the company's presence in Mexico?
Platinadora Baja was established in 1996 and started plating products for commercial applications. Over the years the company has acquired a strong knowledge and expertise on different processes and became more technical and focused on compliance to several specifications. The growth and diversification of the company has been directed by shifts of the economy and the fluctuations of different fields or industries. In the region, the strongest fields are the medical industry and some sectors of the military and aerospace industry. In 2010, Platinadora Baja decided to increase its presence in the military and aerospace sector by opening a pilot line dedicated to this purpose. Our customers helped us significantly in developing our knowledge and quality standards in this sector.
In 2012, Platinadora Baja decided to build a new facility dedicated for the aerospace sector with the idea to become one of the main chemical-processing supplier for this industry. The construction of the new facility took approximately three years and simultaneously our staff developed our quality system and got ready for NADCAP certification, which the company obtained in 2015. The quality system can be broken up into two parts that include the AC7004, basic quality system, and AC7108 for chemical processing.
To obtain these certifications, the team has to make a big commitment, work as a group and dedicate a lot of time and effort analyzing all specs and requirements to determine existing capabilities to run the processes and to determine which ones will be subject to certification. All processes need to be measured and tested. Some of the testing activities like thickness measurement, solder ability and salt spray are done in-house while other more complex and expensive to operate are outsourced. Outsourced tests include gold purity tests and micro hardness tests.

How important is the aerospace industry to Platinadora's overall operations?
When Platinadora started considering to entirely enter the aerospace market, the company 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 customers and the company 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 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. Plantinadora Baja also does cadmium plating for the military, as this finish provides great resistance against corrosion and has excellent performance qualities. The finishes offered are olive drab or military green, yellow and clear chromates.
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 sure that all waste is neutralized, properly treated and confined.

Is Platinadora able to work with the range of specialty materials used in the aerospace industry?
Under NADCAP certification, the plating supplier selects the processes willing to offer and then gets qualified for them. Platinadora Baja offers electroless nickel plating, cadmium plating, gold plating which include copper and nickel under layers, zinc-cobalt plating, zinc-nickel plating, passivation, trivalent and hexavalent chemical conversion coatings, tin and tin-lead plating, type-II and type-III anodizing and the application on solid film lubricants. These finishes cover great part of our current and potential customer demands.

Does Platinadora do composite work for aerospace?
Platinadora Baja does plating of plastics and has done successful trials on composite materials for a couple of customers. We currently do some plating on plastics jobs for commercial customers, but not any aerospace or defense composite or plastic materials. If the need arises from aerospace customers, we consider ourselves ready to offer this service.

Is there a gap between the demands of the aerospace industry and what the local suppliers can provide?
One of Platinadora Baja's growth interests is to offer non-destructive testing, as it is sought after. This service does, however, require a significant amount of funding and training. There is a big gap between the aerospace industry and the local suppliers. Local suppliers still need to undergo a culture change in terms of quality systems. An additional challenge is finding funding to enter the market. It is the government's responsibility to make markets more accessible for them. It can play a significant role in academia, training, and providing funding opportunities for smaller companies to enter markets. Achieving Nadcap certification has been another major roadblock that small companies are forced to deal with due to its training and facility development costs. •

Abelardo Teran

General Manager
MAIS INDUSTRIES/SINCO

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 with 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 Plating 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's 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 contravenes 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 fulfil 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. •

Genaro Manilla

General Director
COAST ALUMINUM S. DE R.L. DE C.V.

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 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 Ensenada 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 cut to our customers' specifications.

Can you tell us more about the process you undertook to receive the AS certification and what were 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 now for aluminum 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 only thing missing right now is for contractors to look for local suppliers. These large companies are still looking abroad for their raw materials so there is no incentive for a distributor to set up here.

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 this sector, not as many of our young engineers are being exported to more mature aerospace industries overseas. •

Angel Torres

General Manager
RYERSON, TIJUANA

Can you provide some background on Ryerson's history in Mexico?
Ryerson is a U.S.-owned company and has been in the metals industry as a corporation for 170 years. We have been operating in Mexico for five years and have facilities in Monterrey, Hermosillo and Tijuana. As a raw-materials distributor we serve any industry that has need for both ferrous and non-ferrous metals as well as a range of special alloys. Our sites in Mexico are strategically located in order to best serve the respective industry clusters. Ryerson have plans of expansion in Mexico in the near future.

How important is the aerospace industry in Mexico for Ryerson?
In terms of business percentage the aerospace industry does not currently account for much, only 5%. However we have identified this industry as a key area for growth. We recently received our AS9120 certification and as such are now an approved distributor for the aerospace industry. Today we are actively trying to increase our business in this sector, particularly in Baja California, where we are witnessing a boom in aerospace.

What are the typical products you are supplying to the aerospace industry and what are the services you are able to offer?
Typically for the aerospace industry we sell mainly stainless steel and aluminum in different forms and shapes. We also are able to provide some special alloys. With regards to our processes we have a leveler to flatten the coil we buy from the mills. We also have a laser cutter, a bar saw and two aluminum plate saws. Our offerings are based on the experience we have form our U.S. sites, which were previously serving some of our customers here in Tijuana.

Why is there a gap with regards to raw materials for the aerospace industry in Mexico?
To develop a local Mexican supplier to be at the level able to serve the aerospace sector is a process that can take years. 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. The cluster is working hard on resolving this, and it will change. It will be a case of allowing a foreign supplier to justify an investment into the country. The low-volume, high-mix nature of the 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 are actively exploring how we can evolve to better meet its needs. •

David Berruecos

General Manager
ELECTRO-MECH COMPONENTS

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 value added tax on imports and about zero income tax. This helped to promote investment in Mexico.
Switch Luz, Electro-Mech's Mexican operation started in Mexico, stated with simple assemblies of parts of machines that were manufactured in the US. In the 1970's, most of the production went into slot machines for casinos but it become tough to compete with the Chinese as they were making huge volumes of switches. Switch Luz then started to support other companies to open operations in Mexico under our umbrella. Switch Luz was thus one of the first shelters in Mexico.
In the late 1970's, the company started to get involved in making parts for aircrafts. This included manufacturing of push button switches. The company has a R&D department where switches are custom made for every type of application. Every part is built in the company's facility and we only buy general use hardware.

How big is the Switch Luz operation and what is this facility's productivity?
There are 45 people working in the facility. The team has an average seniority of 15 years and we have significant experience in the industry. Switch Luz has a team of engineers and technicians working on the designs of products. We work 48 hours a week with no second shift. The facility produces about 100,000 switches a year. The production is divided into different products as customers sometimes want the whole switch and other times just the lenses. In addition we have molding, CNC, soldering and machining operations.
The aerospace sector is exciting for a company like Electro-Mech as we can communicate with the engineers and find solutions to problems together. The products that Switch Luz manufactures are built to design and according to specifications and requirements from customers. The company has an AS 9100 certification and also has its own quality manual which we have developed over the years.

The aerospace industry contributes 75% to Electro-Mech's business. Is the majority of this business in avionics?
Yes, most Electro-Mech products are for the avionic side of the industry. The company does also do some work with regards to the interior of the planes. There are companies that are strong in interior design and they will buy our products and use it in their designs. Thus, the company's products are also used by tier one companies. Indirectly, Boeing aircraft would be the last destination of our switches.

Does Electro-Mech train their own staff or is there sufficient training in schools?
Electro-Mech has a very good bridge between the past and the future and the company is breeding our own engineers. There is a Mexican culture where education does not go beyond high school as of many different reasons like poverty. Our company encourages and supports the young generation to further their education. There is some collaboration with universities, but that is still minimal. For Switch Luz, since it is a small company, we do not hire engineers from outside to operate machinery. Rather, the company builds up our own staff and trains them in regards to engineering and technical abilities.

Can you elaborate on how the Maquiladora program has evolved within the aerospace industry?
From a government perspective, there is much enthusiasm 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 are prohibitive for 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, everything 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 and proximity 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. •

Sergio Tagliapietra

President and CEO
IVEMSA

on the findings of the analysis, we came up with a strategy to target developing industries like the aerospace industry and to develop the supply chain of those industries. IVEMSA holds the majority of the companies that operate in the aerospace industry in Mexicali. Aerospace is a growing industry in Baja and we are targeting the global supplier base of our exciting customers.

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 operation overtime in our country. We are involved in all the tasks and duties related to site selection, managing employees HR, talent recruitment and workforce development, buildings, customs, accounting, back office, supplies and all the things related to the customer's business in Mexico. IVEMSA also introduces our customers to the culture of operating in Mexico.
What are some of the biggest challenges when helping to establish a company within the aerospace industry in Mexico?
Infrastructure, education, the government, and bureaucracy are the main challenges that IVEMSA has had to face. As the company has a good understanding of doing business in Mexico, we can help our customers overcome these obstacles.
Infrastructure will always be a challenge due to the fact that most of IVEMSA's customers come from developed and industrialized countries. Infrastructure development is needed in terms of transportation, connectivity, and the ports. Import and export issues also need to be minimized. With regards to education, it is difficult to find the proper people that meet the needs of the customer. The aerospace industry requires highly qualified workers and the norms and certifications are different from other industries. To qualify employees for the aerospace industry is a challenge.

GKN has been established in Mexico for a significant amount of time. What is the nature of the work IVEMSA does for GKN today?
Currently, IVEMSA administers GKN's business in Mexico. We are involved in its imports and exports and also hire people so as to meet the demands of the company. We manage GKN's and our customers' daily activities so that they can fully concentrate on technical issues, production, quality and schedule product delivery. IVEMSA is responsible for taking care of the environment, the buildings, and accounting issues. Established companies keep using IVEMSA, as it is a certified company and offers high-quality services.

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 to attract new customers to Mexico. We also have a marketing structure where we generate our own leads and we 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. ProMéxico also offers help and referrals from customers, which is very important in attracting new customers and developing the supply chain in Mexico.
Suppliers are not only sourced from abroad, but in some cases we will look for investment into a local supply company as to develop the local company further. IVEMSA wants to retain existing customers and part of the retaining process is to identify suppliers that meet the requirements of our customer's operations in Mexico.

Do you have a final message for the international aerospace community?
State and regions in Mexico differ from each other. The federal government needs understand that and establish a public policy as to develop the northern part of Mexico. The aerospace industry is a reality, and we need to sustain this industry by providing incentives to investors. We need have policies to attract, retain and make our businesses grow.
Aerospace companies must also adapt their own local supplier development policies to truly increase the number of Mexican companies in the value chain. If more local content is integrated to the aerospace products made by these foreign companies, costs will be minimized and the sector's competitiveness will be boosted. •


RN


AP

Rigel Navarro & Alejandra Portugal

RN: Executive Director
AP: Aerospace & Defense, Business Development Executive
TIJUANA ECONOMIC DEVELOPMENT CORP.

Can you give brief introduction to the Economic Development Corp. (EDC)?
RN: The Tijuana EDC is structured as a chamber of commerce. It consists of paying members, which makes it a non-profit, private trade organization. The focus of the organization is to have uniform practices as to attract industrial manufacturing companies to Tijuana. The founders and members of the EDC are service providers for the manufacturing industry that are looking to establish themselves in Tijuana.
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 linkage 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 important has the aerospace sector been for the EDC and how has the organization contributed to the growth of the sector?
AP: The EDC focusses 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 or suppliers. 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 type of relations does the EDC nurture with your counterparts in the United States as to facilitate exchanges within the CaliBaja region?
RN: The CaliBaja Mega-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 the cost-reduction strategy, the EDC and its U.S. counterparts have to collaborate. Baja and the US are two different countries that operate in the same CaliBaja region, which has an interesting flow of trade, human resources, and communication. The only limitation is the physical border.

What hurdles did the organization have to overcome and what support can the EDC offer to companies looking to establish themselves in the CaliBaja region?
RN: In terms of the services that the EDC can offer, our first focus is to promote the city and show the region's advantages. The EDC will present potential investors with a consultation session on how to get started. All aspects, like taxation systems and the IMMEX Program (commonly referred to as maquiladora program), are covered. Investors can also raise concerns, and the EDC will focus on those areas as to make them feel more comfortable. The organizations main services are providing information, guidance, and professional referrals.
AP: Currently the major hurdle is to overcome the image that the region has in terms of safety and security. One of the biggest game changers has been promoting as a Mega-Region. A great example of our regional collaboration for investment attraction is the Paris Airshow, for which there was a large delegation from Baja California. The delegation was joined by Adriana Eguia, who is the Director of the CaliBaja Mega-Region, and Mark Cafferty who is the president and CEO of the San Diego EDC. Meetings were joint and opened a significant amount of doors for CaliBaja to encourage companies to view the region as an option for binational operations. Keep in mind that CaliBaja encompasses San Diego County, Imperial County and the State of Baja California, so this is a really complete support system for new companies.

How does EDC attract companies in order to consolidate the supply chain?
AP: It is often challenging to attract companies, as the industry requires many approvals and certifications. The EDC tracks down the demand of certain products and services and creates awareness of these demands. The organization presents this information to companies that are already certified and approved, to see if there is an opportunity for them to expand their operations into the region. In some cases, larger companies require the presence of a specific supplier in the region, and we assist with their soft-landing. The EDC will provide consulting services to interested companies as to advise them on how to proceed with the establishment of their operations.
In terms of skilled labor, the EDC has good relationships with academic institutions with the linkage committee in Tijuana that can link academia with industry to develop the human capital that the industry needs.

Do you have a final message?
RN: Mexico is a large playground, and each region has particular advantages and differences. The EDC can explain the advantages and differences of each and find the right fit for a certain company's business strategy. With the maquiladora programs, advice to succeed is readily available. Tijuana is constantly developing skilled labor, which is a great advantage to expanding companies. •

Image: Zodiac Aerospace

CHIHUAHUA: A WORLD-CLASS CLUSTER MORE DESERVING OF THE SPOTLIGHT

"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
"

INTRODUCING THE AEROSPACE INDUSTRY IN CHIHUAHUA

Image: Textron International Mexico

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.

Less than two decades old, the sector was ignited by the entrepreneurial whims of local pioneers—Luis Lara of American Industries, de León of SAFRAN Labinal and the foundational FEMIA team, as well as José Luis Rodríguez of Fokker Aerostructures, to name a few—and facilitated by the region's automotive maquiladora history. There are still gaps to be filled, but Chihuahua remains an underrated aerospace destination given its present capabilities.

History

The city of Juárez, located on the El Paso-Texas border, was the headquarters of Mexico's maquiladora ascendance in the 1960s. Juárez was home to one of the first industrial parks servicing 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 worked to attract additional aerospace projects to Chihuahua in the 1990s, fighting both the uncertainty of locational nuance and the decline in aircraft demand following the end of the Cold War. Aerotek eventually won the bid for supplying Airbus 319 and Airbus 320 harnesses, continued on to work with leading business-jet manufacturer Cessna, and was acquired by the multinational systems-and-equipment supplier SAFRAN. After years of planning, preparation, and promotion via the public and private sectors, Cessna, Honeywell and Beechcraft installed facilities of their own in Chihuahua City in 2005. Since then, Chihuahua's aerospace sector has grown exponentially, attracting more than $1.5 billion in investment. As a potentially foreboding example, the original major aerospace investor in the state, SAFRAN Labinal, now claims the largest wiring shop in the world, as its Chihuahua facility employs nearly 4,000 people.

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 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 Azúa, 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 aerostructures, "which is especially positive given the lack of expertise in aerostructures wiring in Mexico," explained Cesar 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," says Diaz.

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. •

Manuel Russek

Secretary
SECRETARIAT OF ECONOMY, CHIHUAHUA STATE GOVERNMENT

Please give a brief overview of Chihuahua's current economic situation, and its status concerning foreign direct investment (FDI)?

Chihuahua is one of the preferred locations to invest in Mexico due to five main reasons: strategic location (right next to two US Border States), talent availability (skilled human resources), state-of-the-art infrastructure, specialized training and educational centers as well as an attractive market with a supply chain that provides maximized profits. Skilled labor is not merely generated by excellent training; rather, it's a result of having decades of workers in the manufacturing environment, which translates in a safe labor environment.

In terms of employment, FDI and GDP by sector, Chihuahua has a vocation of manufacturing, engineering and design because more than half the total employment is educated in those areas. In Mexico, one out of every four jobs are located in manufacturing; in Chihuahua it is one out of two. Over 75% of the FDI and 20% of GDP recorded by Chihuahua is manufacturing related.

Why is Chihuahua such a competitive investment destination? What types of international 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 1 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 portrayed by the $7 billion USD invested 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 inhabitants, only 3% of Mexico's total population, 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 graduate from our schools. Though we do not have as many companies as Baja California, we have larger facilities to accommodate a greater workforce. Chihuahua's strong range of industrial clusters consists of over 550 world-class companies.

Chihuahua has the largest area of industrial real estate in Mexico, with 80 million sq. ft. of facility space, 7 million sq. ft. of which is still available. Ford is going to build a 1 million sq. ft. engine facility here worth 1.3 billion USD, hiring 1,500 new employees to produce the new generation 3 cylinders, 1.5 L engine—manufactured in its entirety in Chihuahua and sent to locations around the world. Our business friendly environment is partially attributed to our lack of unions.

What role does aerospace play in Chihuahua's economic footprint?

The headquarters of Mexico's entire maquiladora 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 efficiency and quality driven processes. Chihuahua houses one of the most advanced precision machining operations centers in the world belonging to Honeywell, operating more than 1,100 CNC machines in a 400,000 ft2 facility here in Chihuahua. In the aerospace sector, there are over 45 companies—including five out of the seven OEMs in Mexico, accounting for over 17,000 employees.

Aerospace has experienced $2 billion in investment, $2 billion in exports and $1.5 billion in imports over its lifespan in Chihuahua. Aerospace has more than 5 million sq. ft. occupied by industrial buildings, which will increase by 75% in 2016 alone, due to the known impending investment projects. With these new projects, Chihuahua is soon to be the largest producer of aerostructures in Mexico.

Juarez is one of the largest manufacturing centers in Latin America, and there are 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.

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 betterment of the aerospace development. These experts plan to buy international companies and bring them here to supply the local market. Chihuahua has many great businessmen with even greater resources that can buy key components and stabilize operations here.

As a government we have been collaborating with the OEM's such as Boeing, Embraer, Airbus, etc. to understand what is needed for Mexico to have a final 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 entrepreneurs, both foreign and local, are already involved in making this idea a reality. The timeline will depend on the market and the MRO integration. •


RE


MV

Rene Espinosa & Mónica Vega

RE: President
MV: Cluster Manager
AEROSPACE CLUSTER CHIHUAHUA, MEXICO

Please provide an introduction to the Chihuahua Aerospace Cluster, highlighting the key initiatives to date.

The Aerospace Cluster of Chihuahua's foundation is a triple-helix model, revolving around the synergy of educational institutions, the government, and the private sector. The cluster began to formalize in late 2007 and chose this model to encourage integration between the main players of each critical element. The cluster operates under the association of Export Manufacturing Industry, Index Chihuahua, which is present in most major cities in Mexico. Through Index, the Secretary of Economy and the Secretary of Education as honorary members, and all the companies along with the major industrial representatives participate in our endeavors.

The Chihuahua Aerospace Cluster has six main pillars, which set the precedent for our current initiatives. First, we have the pillar of academic entailment, which encompasses the work that we do in collaboration with education facilities. It is critical to review the curriculum of academic tracks towards careers in our industry, such as engineering majors, so that we can assure that the knowledge that students gain will directly transfer into the field and fulfill industry needs. The second pillar is supply-chain development, working with all of our various entities in developing our local suppliers and attending the specific requirements that our companies need in order to complete the missing links in the supply chain. The third pillar, technology, is governed by a technological roadmap that was developed in 2013, identifying 27 key technological packages that will steer Chihuahua towards a more prosperous 2023. The fourth pillar is promotion, in which we work in collaboration with the major industrial 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.

With regards to membership, who are the major players driving the growth of the region?

Honeywell Aerospace, Textron Aviation (a merger between Cessna and Beechcraft), Bell Helicopter, and a really interesting joint venture between Embraer and Zodiac, called EZ Air, comprise the list of original equipment manufacturers (OEMs). EZ Air is considered the fifth out of the seven OEMs in Mexico.

Also, we have certified world-class companies such as SAFRAN Group (number one employer in the Aerospace industry in Mexico), Zodiac Aerospace with nine different, diverse divisions ranging from emergency systems, water and waste systems, to seat designs and manufacturing, Fokker GKN and many more. Over the past five years, the cluster has developed a strong competence in aero structures and machining, serving the major OEMs in North America such as Boeing, UTC, Triumph, Bell Helicopter, Bombardier, etc.

Textron Aviation, for example, has impressive facilities, one of them dedicated to composites in which approximately 90% of one of their models is constructed. Honeywell Aerospace also has over 1,200 CNC machines in Chihuahua, which makes this operation the largest high precision machining center in Latin America. It is a diverse cluster and, when paired with collaboration, increased productivity is inevitable.

Joint ventures and mergers and acquisitions seem to be more common in Chihuahua than in Baja California or Querétaro. Why is this?

Chihuahua is historically known for its manufacturing. Many international companies find solace in the knowledge and expertise of our local entities, as they have a better understanding of the market. There are also groups of investors with backgrounds in automotive and manufacturing that are looking to expand into the aerospace industry, making joint ventures with a Chihuahua company extremely attractive.

Stemming from the promotion pillar, the cluster is now looking for companies that will complement what we already have established in Chihuahua. We aim to be precise in our choices, targeting those who can best steer us in the right direction with our vision. In our experience, some large companies have relocated to Chihuahua spurring investment and employment but are not expanding the supply chain.

Since it borders to the United States, Chihuahua's export manufacturing industry has grown exponentially in comparison to other regions of Mexico.

As a final message, can you pinpoint some of the key strategic advantages that Chihuahua has to offer?

The most obvious advantages are our location close to the border and experience in manufacturing. Yet the integration and the synergy among all of the members of our industry is the driving factor towards present and future success. The members of the cluster, educational institutions, federal departments, human resources, and industrial promoters are all collaborating in order to understand the needs of our sector. Instead of competing, we are merging forces to achieve even more. For example, Fokker GKN brought wing assemblies to Chihuahua for Honda Jet. In order to bring that project to our state, we efficaciously merged forces bringing new process certifications, machining and sheet metal capabilities through current suppliers established in the region, resulting beneficially for seven different companies. As a cluster, we continuously aim to provide these types of creative business opportunities that will help grow our industry and local capabilities. •

Luis Lara

Chairman of the Board & CEO
AMERICAN INDUSTRIES

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 provide a brief overview of your background and how you got involved in the aerospace sector in Chihuahua?

It was a local entrepreneur that encouraged me to get involved in bringing foreign companies to Chihuahua City, which is a difficult task given that the El Paso border offered clearer opportunities. However, we managed to convince a company in the defense sector to supply the aerospace industry here, and a plant was built for the General Dynamics F-16 Fighting Falcon assignment. A company called Aerotech was established. Then, after a few months, Lockheed Martin became our customer, since they bought the F-16 program from General Dynamics, and they eventually discontinued manufacturing certain metal products. I took the opportunity to buy them out through Aerotech. In the 1990s, I sought commercial opportunities to increase volumes due to a decrease

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 70% of labor and 30% of materials; engine overhauls 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 for the MRO offshore in China, Sri Lanka, Poland, or Mexico, given that a majority of the cost is labor-induced. The price of maintenance for a commercial airline per hour is about $90. Chihuahua can provide this service for $50 and make a profit. An Airbus 320 requires 150 qualified people to conduct 200 hours per month of this work, 12 months a year. Examining 10 planes, which involves 1,500 personnel, if an airline can save $50 per hour per plane for 200 hours per month, 12 months a year, they are looking at incredible savings by availing our services.

Given that the industrial space for aerospace is expected to increase by 75% in 2016, how do you plan to attract foreign companies in terms of human capital and the quality of labor in Mexico?

We must show companies that skilled labor exists in Mexico and set up agreements to work with American universities to bring talent and training to Mexico in order to certify more workers. The companies to which we sell these services have their own certification processes. According to our knowledge, there are 25,000 airplanes flying in and out of the United States on commercial aircrafts. We would be happy to have 10 of those planes every month to maintain, and Chihuahua has the knowhow for maintaining planes, replacing components, and servicing them fully.

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 investing in the United States and assembly plants in Shanghai. Boeing is creating a subcontract of assembly, an offset deal for Boeing in Shanghai, because it is questioning the cost savings from assembling in China for an order coming from the United States. Airbus is turning towards China to reduce their costs and be cost-competitive.

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 increase their competitiveness. •

César Díaz de León

Director of Operations
SAFRAN LABINAL POWER SYSTEMS CHIHUAHUA

Can you provide a brief history of Safran and its current operations?

Safran Labinal began operations in 1998 with the acquisition of Aerotec, a company founded by Luis Lara back in 1990. Safran has been pioneering the aerospace industry 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). Three years later, Safran opened its 100,000-sq.-ft. plant, which later became a 303,000-sq.-ft. plant, making it the largest wiring factory in the world. Today Safran provides support for 10 customers worldwide, including Boeing and Airbus, and within the next couple of days we will be opening another plant in Chihuahua, adding 700 more jobs to the area.

In this particular plant, Plant Two, the best asset is Safran's people. Safran has the laser equipment to cut and mark the wire and the electrical equipment used to test all wiring before it is taken to the assembly line. Given that Safran is a tier-one supplier, products are directly shipped to the customers and installed directly into the aircrafts, which requires the company to be extremely thorough in its testing.

Where does Safran recruit its employees? What sort of training do they receive?

Depending on the different positions, there are different training programs in place. To best monitor and support them, the trainees are given green jackets for the initial three months. After those months, they take exams to measure their productivity and skills and become certified Safran production assemblers, graduating to blue uniforms like the other operators.

Safran has over 250 engineers, many coming from the technical universities in Chihuahua. In 2006 Safran, with government aid, pioneered the study abroad program EPEX ("Estudiantes de Practicas en el Extranjero"), sponsoring seniors in college for six months to one year internships at major engineering companies in the United States (specifically Seattle, Dallas and Salisbury) and Toulouse, France to develop their talent. Safran has sponsored over 150 engineers throughout the past 10 years. Most of the students are coming from the design office; however, their growth is not merely technical, it is holistic. They gain cultural and linguistic knowledge and their minds are more globalized.

What activities or accomplishments has the design office achieved?

The design office is mainly focused on electrical wiring, the connecting systems. Recently, it has become more involved in aero structures, which is especially positive given the lack of expertise in this area in Mexico. Furthermore, they built the entire electrical wiring interconnection system design for the 787 program.

What are the trends you have seen in terms of electrical systems? How has technology advanced to better those systems and processes?

Aircrafts will increasingly become more electrical, replacing the hydraulic, mechanical and pneumatic systems. With this in mind, the importance of electrical wiring will grow and thus the demand for more electricity on board. Safran sees this as a large opportunity for the electrical power systems area. Given the pressures airlines are facing to make planes lighter and more efficient, the light weight of the electrical wiring is an additional benefit.

How significant are the Chihuahua operations in relation to Safran Global?

This particular division for aircraft equipment forms the largest company of Safran in the world. It ships half a million harnesses a 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.

How does Safran view the local supply chain? Where do you think there are still opportunities?

It is in Safran's best interest to develop its supply chain in Mexico. It has operations in Querétaro, developing engines and landing gears, and they are working to develop the supplier relationships through investments and government aid. Safran Labinal has grown its supplier base in Chihuahua, and is still working to relocate additional suppliers in Mexico.

Can you tell us about the new plant and the expectations for it?

In the new plant, Safran will be developing the wiring for the 777, the 737 and the A350 aircraft models for Boeing and Airbus. There are approximately 660 employees in it and Safran hopes to reach 700 employees. The plant will add capacity to the happenings of our other plants, which is electrical wiring for the aircrafts. Safran has seen steady growth since its beginnings and it needs to focus on maturing its work force and processes now.

Is there a final message you would like to send our international aerospace readers from Safran in Chihuahua?

Safran Labinal is very happy to be here in Chihuahua and has the confidence in both the skills and enthusiasm for learning that its employees exhibit. We are thankful for the immense government support as well as that from the educational institutions, both of which have been instrumental in Safran's success and journey to where it is today. •

Luis Azúa

General Manager
TEXTRON INTERNATIONAL MEXICO S DE RL DE CV

Operating under Canadian Textron, Bell Helicopter is one of the leading helicopter original equipment manufacturers in Mexico. Please give an overview of its presence in Chihuahua?
Bell Helicopter has operated in Mexico since 1964, and continues to have a growing local presence. In 2009 we opened this 125,000-sq.-ft. manufacturing facility, Textron International Mexico, in Chihuahua, which supports many components for Bell Helicopter's commercial product line. The company has also two authorized customer service facilities that provide aftermarket support and services. In 2014, cabin-assembly capabilities were transferred to our facility in Mexico and, in 2015, Bell Helicopter opened an office in Mexico City, which serves as the hub of sales operations in Mexico.

What certifications does Bell Helicopter's Chihuahua facility hold?
Bell Helicopter's building is LEED Silver certified, has a clean industry certification from the Mexican authorities, and is certified by DGAC and AS9100. We have an internal certificate of compliance for our electrical harnesses, which are inspected and tested in-house. In 2012, the Chihuahua facility received the president's award for safety performance from Bell Helicopter 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 structural assembly services, conducts electrical testing, 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 institutions such as: Instituto Tecnológico de Chihuahua (ITCH), Universidad Autónoma de Chihuahua (UACH), Universidad Politécnica de Chihuahua (UPCH), instituto Tecnológico de Estudios Superiores de Monterrey (ITESM), Universidad La Salle. Cenaltec also played a very important role during the start of our operations, as many of our employees were trained at this center. Additional talent has also come from other areas of the country. Furthermore, we offer an internship program to help develop and promote young engineers and technicians.

What products and services are presently in greatest demand?
The Bell 412 continues to be in demand in regions where customers need a reliable, modern aircraft that can serve multiple missions – search and rescue, parapublic, utility, etc. We see tremendous opportunity for the 412 and the 429 in the parapublic segment. The selection of the 412 by the Japan Ministry of Defense illustrates the demand for proven and reliable aircraft. The Bell 429 also had another strong year, with over 50 deliveries, particularly in the parapublic and emergency medical services segments.
The long-term view of the rotorcraft industry remains positive. We expect 2016 and 2017 to be like 2015 and remain relatively flat. Yet we expect the market to pick up at the tail end of 2017 into 2018.

Is there anything currently in development that will enhance productivity?
As part of its pursuit of excellence and continuous improvement culture, Bell Helicopter is currently looking for opportunities to incorporate 'autonomation' into many of its operations. Autonomation is the right level of automation with human-operated tools. Since one of the most repetitive operations is drilling on composites, the company is creating a station that will allow it to drill hundreds of openings with the required location 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 accidents, reducing DPA, minimizing scraps, achieving on time completion and delivery, reducing down time and hours per aircraft, training and developing of employees and realize 99.2% employee retention. Although we can increase our output, Bell Helicopter is currently meeting our customer demands.

Where does Bell Helicopter hope to be in two to five years?
Bell Helicopter is expanding its position as the innovation experts in the rotorcraft industry by upgrading existing products, developing derivatives, and introducing new models, including the 525 Relentless and 505 Jet Ranger X. These models showcase the company's capabilities. Additionally, Bell Helicopter is upgrading existing and exploring new military-focused products including the development of the next-generation tiltrotor technology (V-280) for future product offerings. A key focus is on executing current commercial and military programs, including the UH-1Y, AH-1Z and V-22 programs with an increased focus on the mission requirements of military customers as well as pursuing international opportunities for these platforms. Bell Helicopter also plans to strengthen cost competitiveness through continued improvement in worldwide manufacturing productivity and modernizing business systems. Employees in Chihuahua are an integral part of these plans and footprint. •

Baptiste Valois

General Manager
ZODIAC AEROSPACE EQUIPO DE MEXICO

Can you provide a brief history of Zodiac Aerospace's presence in Mexico and the span of its footprint thus far in Chihuahua?
Zodiac Aerospace started operating in Mexico in 2005 with the acquisition of C&D Aerospace, which had a facility in Tijuana since 1992. The Tijuana facility now consists of four plants and over 2,000 people dedicated to cabin interiors. In Chihuahua, Zodiac Aerospace started in 2006 with the manufacturing of evacuation slides, and has grown since then from one operation to nine operations, working across five plants, 56,000 sq. meters, and 3,000 employees. All of the three business lines of Zodiac Aerospace—cabin interiors, seats and aerosystems—are represented through the wide variety of products manufactured here, such as evacuation slides and rafts, seat subassemblies, electrical subassemblies, harnesses and conduits, cockpit panels, composite shells, toilets, and water and waste composite tanks.

Why was Chihuahua specifically chosen for Zodiac Aerospace's further expansion in Mexico?
Zodiac Aerospace is a large group that is balanced between Europe and the United States. Back in 2005, we reflected on our industrial strategy with the intention to develop content in cost-competitive countries. For logistical reasons, our approach has been focused on countries that were either close to the homeland and systems control or close to our customers. Chihuahua is close to the United States, and close to our seat facility in Gainesville, Texas. It also has an impressive industrial history, as it has been developing manufacturing activities since the 1970s in the automotive industry. In 2005, many international aerospace companies began scouting Chihuahua, and Zodiac Aerospace was one of the aerospace pioneers that first established a location here.
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 aero evacuation systems plant is the only facility in Mexico with FAA-authorized personnel who can release final, airworthy products with FAA tags. From Chihuahua, we are shipping directly to customers, which was the global office's intention from the start. We want to grow from raw materials and processes to finished products and, though we are not at that stage with everything we produce here—we are also part of an internal supply chain, where some of our facilities supply other Zodiac Aerospace facilities—maximum value addition is the goal. Water tanks and toilets will hopefully be our next final products to be drop shipped from Chihuahua.

What challenges are affecting Zodiac Aerospace's growth in Chihuahua?
In Chihuahua, Zodiac Aerospace has achieved significant growth thus far, adding 2,000 people and 25,000 sq. meters to our facilities in the past three years. Though the Zodiac Aerospace Group has an objective of consolidation for 2016, we see great opportunities to grow locally according to the drive of business. Buildings can be extended when needed, as we have a total of 77,000 sq. feet reserved on campus. Availability of labor is the steepest challenge at present. There is a great deal of demand, and over the next six months, around 5,000 maquiladora jobs will be created, leaving a poignant question of whether or not the human capital will exist. Last year, 150 people to 200 people were visiting our recruitment center every day in hopes of being hired; whereas nowadays, it might take a full week to receive such an amount of candidates. It is getting difficult to find the skills that we need. If the work-pool is drying, we need to work with the authorities to bring more people to Chihuahua. Our growth can only be reflective of human talent.

Through what means of innovation is Zodiac Aerospace able to reduce the weight of onboard equipment to improve aircraft performance?
Material choice is a strong driver. Replacing metal parts with composite parts when possible is an area of Zodiac Aerospace's expertise. We try to reduce the number of components needed to develop the final product, but also think ahead about the passenger experience. For example, we are replacing heavy, centralized in-flight entertainment systems with passenger-centric ones where passengers can use their personal devices to enjoy and display their videos. This reduces space and weight, and creates new entertainment experiences.
We are proud of our design activity, which represents 130 people here in Chihuahua working mostly on seats. Over the last six years, this team has supported the development of more than 70 programs while reaching worldwide recognition for its innovative concepts with the Red Dot awards in 2014 and 2015. We are competing again this year for the Crystal Cabin award that will be delivered at the Aircraft Interior Exhibition with our posture seat concept, a concept that was fully developed in Chihuahua in cooperation with universities and partially funded by CONACYT. This posture 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. •

Luis Carlos Ramírez

General Manager
EZ AIR 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 was already successful in its operation of several plants in the city.

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 unique integration is that both the supplier and the client are the owners of the company.

Can you elaborate on the processes and products EZ Air Interior Ltd. provides?
EZ Air Interior Ltd. creates a product from start to finish. This means that we initiate the process with raw materials, which are transformed and manufactured into the different parts for the interiors of Embraer cabins. All parts of the interior of the aircraft, except the seats, are pressed, cut and assembled by us, here in Chihuahua.

Is Chihuahua a good environment for other aerospace joint ventures to be created?
Mexico being a competitive cost country is not the only contributor to the success of EZ Air Interior Ltd. in Chihuahua. Zodiac Aerospace has found excellent design schools in the area, and an abundance of talent in the realm of value addition. Mexico continues to develop its capabilities from initial design to the manufacturing of the parts and is already looking into how it can adopt the latest technologies. What still needs to be develop is a stronger supply chain within the country. Developing a local supply chain would create an immense amount of opportunities for joint ventures in Chihuahua.
Chihuahua is advantageous in that it has a significant amount of talented human resources to offer. The city is very cost-competitive and can offer excellent engineers to the industry. Technical resources are also being developed as there is a great demand for mid-level technicians in the aerospace industry.

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 this 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 processes 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 expediting 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. •

BUILDING THROUGH COLLABORATION

Synergy in the Industry

Chihuahua's differentiation from other maquiladora states mostly lies in its location and multi-angled collaboration. Firstly, its proximity to the world's most demanding aerospace client, the United States, can be broken down into a variety of convenience factors. Other maquiladora hubs rest closely to the U.S. border, but Chihuahua's centrality and organization saves time logistically. More than 1 million people cross the border between Mexico and the United States each day, one fifth of whom utilize one of Chihuahua's 10 crossing stations to and from Texas or New Mexico. Chihuahua City's airport services flights to the United States, but is still relatively limited in destination diversity. "Due to the 45 free-trade agreements between Mexico and its allies, we have access to 1.2 billion consumers," stated Lic. Manuel E. Russek, Secretary of Economy of Chihuahua, "…Chihuahua is driving the economic development of the nation."
Nationally ranked as the preferred investment location in Mexico, 185 new projects across industries have seen fruition within Chihuahua's borders, generating 160,000 new jobs in the past two decades. Around 15,000 jobs are currently occupied by the aerospace sector.
Secondly, Chihuahua truly reaps the benefit of a functioning triple-helix model, whereby industry, academia, and government unite in the effort to implement the vision for the future of the aerospace sector. Operating under the purview of the maquiladora association, Index, the aerospace cluster, is governed by Chihuahua's own set of roadmaps that are dedicated to attracting international investors, pushing the involvement of local companies, and furthering the aptitude for research and technology. "Over the past five years, Chihuahua has developed a strong competence in aero structures and machining," noted Rene Espinosa, president of Chihuahua's aerospace cluster, "It is a very diverse cluster and, when paired with collaboration, increased productivity is inevitable."
Unlike most stories of government intervention, the majority of executives across the aerospace spectrum feel that the Chihuahua's administration is taking a helpful approach to develop the sector. A member of the Centro de Desarollo de Proveedores de Chihuahua (CEDEP), Arturo Avila, noticed a gap in the market for high-precision machining in the state. With government grants to purchase the machinery, Avila broke into the aerospace market

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 torque machines of this kind, but what we did not realize was that 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, three-axis mills, non-conventional machining, grinding, and now multi-axis vertical lays—business catalyzed, and within months Altaser needed to relocate to a larger facility. When Altaser began, it was the only independent machine shop creating aerospace parts. "Today you can see many, and all others are foreign companies. Mexican companies should not be discouraged from entering 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 partnership with Kilgour and received the backing of Grupo Punto Alto, an investment holdings group focused in financially supporting 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 Alberto 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 create a more cost-effective engineering service so manufacturers can outsource the necessary machine programing that is required by each specific aerospace company.

On a grander scale, the Desarollo Economico del Estado de Chihuahua (DESEC) continues to work on enhancing the advanced manufacturing capabilities of small- and medium-sized enterprises (SMEs) within the state. In 2008, DESEC partnered with ProMéxico to take on aerospace as a means of fulfilling its vocation of creating wealth for the regional economy. The automotive recession at that time resulted in job cuts for more than 150,000 people in Chihuahua, starkly reiterating the need for greater diversification. "Over the years, the development of the aerospace sector has helped to elevate the capabilities of Chihuahua's workforce. With $150 million going directly towards aerospace payroll and $450 million indirectly, quality of life has greatly improved and continues to increase," said Alejandro Casas, director of DESEC.

He hopes that the initiatives in place will increase the number of aerospace employees by 25% in the coming years.

As stated in Mexico's Aerospace Industry Roadmap 2015, the two goals guiding government initiatives are as follows: "to innovate, develop and enhance the design of product and their parts; and to certify the parts in question for the aerospace industry."

Chihuahua's strides toward realizing the first objective can be seen through the creation of FabLab, a flexible manufacturing laboratory located within the Innovation Technology Transfer Park of the Monterrey Institute of Technology and Higher Education's Chihuahua campus (Instituto Tecnológico de Estudios Superiores de Monterrey, ITESM Chihuahua). Based on the Massachusetts Institute of Technology global-network model, FabLab serves as an advanced metalworking and prototyping station via the latest in CNC and reverse-engineering technologies. "FabLab's ROMER Absolute Arm has a laser that scans a part for a template and quickly digitizes a part or object to create a replicated tool, which is particularly helpful to the aerospace companies that require tools where the original drawings are no longer available. It also provides three-dimensional computation and accurately identifies dimensions that are out of tolerance from the original parts," explained Sergio Mancinas, director of FabLab.

The first of its kind in Mexico, this manufacturing and product-development company has already worked with many international players, including Kaman Aerostructures, Zodiac Aerospace, and Fokker Aerostructures. FabLab hopes to expand its diversity of equipment, 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 and design center for engineering services to directly meet the needs of OEMs in Chihuahua.

The second challenge—obtaining the proper certifications—is assuaged through the help of the locally NADCAP-certified institution, the Centro de Investigación en Materiales Avanzados (CIMAV). CIMAV is a public-research center devoted to advanced materials and belongs to the National Council of Science and Technology (CONACYT). Dr. Juan Méndez Nonell, general director of CIMAV, notes that the rationale behind placing this facility in Chihuahua was due to the strength of the local government's support, it being a developing nucleus for the aerospace and automotive industries, and the absence of research centers in the northwest of Mexico. Equipped with three transmission electron microscopes and three scanning electron microscopes, this laboratory conducts chemical analysis, materials testing and magnetism research critical for materials and composites development. One of CIMAV's greatest successes was developing a software application that supports commercial aircraft harnesses for SAFRAN Labinal, doubling their production and growth in Chihuahua. "We continue to partake in valuable advancements in material performance—i.e. improving aluminum alloy nanoparticles via dispersion, enhancing its characteristics and resistance with a resultant weight reduction for the material. Other projects have included: development work for the manufacturing of bushings for aircraft flight systems; modernization of polyurethane foam for aircraft cushions; and software design development support for harnesses in commercial aircrafts," said Dr. Méndez.

In accordance with industry demands to make materials lighter, stronger and more flame retardant, future research endeavors will integrate aluminum, polymatrix, and lightweight metals. Through CIMAV, accreditation is expected to be granted to thirteen different material tests, allowing pieces to receive NADCAP certification and subsequently penetrate the aviation market.

In addition to furthering Chihuahua's innovative design and composites capabilities, the idea of being able to construct a complete aircraft remains in the background of organizers' minds. "In the short and medium term, we hope to see further involvement in regards to windows and wings, landing gears, treatment processes, safety equipment, fuel systems, assembly for the construction of aircrafts, MRO services, equipment for kitchens, and the addition of some electronic components," explained Casas of DESEC. "The supply chain currently occupies a lot of our attention when talking about opportunities." •

Ing. Arturo Avila Cisneros

General Manager
ALTASER AEROSPACE

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 (CEDEP), which was oriented towards getting local industrials incorporated into the supply chain for large global companies, many business opportunities were detected. There was a lot of struggle along the 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 participate and started from scratch by contacting potential customers. In December of 2011, Altaser was legally established as a supplier in Chihuahua pursuing Aerospace work on machined parts.

Grupo Punto Alto (formerly Grupo Copachisa) is the majority owner of Altaser, an entity that has been critically engaged in both our development and many other grand opportunities for this city. Altaser's first job was to produce blanks, pre-machining parts, for Honeywell Chihuahua HCMO prior to our AS9100 certification. Altaser was granted a temporary waiver by HCMO—facilitated by the vision of Mr. Felipe Sandoval, general manager of HCMO—and began producing parts within five months. We originally thought it would take years to initiate selling airplane components, and our business strategy revolved around tooling. Honeywell gave us productive parts up front, and the majority of our sales concerned holding fixtures and measuring gages. Altaser's focus evolved into components.

In 2012, we joined TechBA, in the business acceleration program, which has given us access to experts worldwide. With the help of TechBA and ProMexico, we have recruited international experts to help train our local talent. Altaser is a Mexican business, and we intend to provide more opportunities for Mexicans. We invest a lot in developing a local workforce, which is well represented by the fact that within our first year, we spent around $250,000 on training alone. Supported by CONASYT's "Estimulos a la Inovacion" program, Altaser works with CIMAV (Advance Material Research center of Chihuahua) and the University La Salle de Chihuahua to develop processes and products.

From the beginning, our target was joint-ventures, but as a small, new Mexican company trying to do business in aerospace, they were difficult to secure. I visited no less than 20 companies with joint-venture proposals, and we were continually told that we did not have a chance making it in such a sophisticated business. Rather than becoming discouraged, we pressed on. Now Altaser has multiple companies hoping to partner with it.

How did Altaser establish its partnership with Kilgour?

Altaser was already substantially established, selling parts to majors such as Honeywell, Fokker, etc., when we met Ray Kilgour. A broker brought him from the U.K. to Mexico, and he was touring a heat-treatment facility, of which Altaser owns a portion. Ray was merely looking to see how the equipment was installed, but after long talks and negotiations he became interested in what Altaser has to offer. Kilgour is a highly respectable, third-generation, family-owned business, and Altaser's next natural step was to get involved in treatments. Today, Kilgour Altaser Treatments plant (KAT) is a 50-50 partnership, where Kilgour is bringing the expertise in special processing, and Altaser has local managing experience plus an established customer network. Altaser continues with local machining operations that are 100% Mexican.

We also see a market for selling engineering services, an area in which we plan to expand our partnership. Kilgour has a great deal of experience in that regard, with senior engineers that are well versed in engines and landing gear. Certifications are arduous in the aerospace industry, but the hardest part of the process is actually programing the machines. A great deal of time and money goes into developing the necessary programing to cater to the specific dimensions for each aerospace company. Many international companies offer programming capabilities, but the cost of those engineers is extremely high. Together with Kilgour, we plan to create a more cost-effective option.

Do you have a final piece of advice for local entrepreneurs looking to break into Chihuahua's aerospace market?

Getting a joint-venture upfront is not the only indicator of success. Entrepreneurs need to dedicate the time to collect information, research FEMIA reports, and solidify their strategy on fulfilling a need. A good business plan will go a long way, and with that one should be confident in approaching the big players. If you can offer a solution to a problem, companies will be eager to work with you no matter what their caliber. GE could not find a supplier in Mexico with a vertical lay of 40 inches, and so Altaser bought that machine, and GE filled it with work. Look for voids in the supply chain and ask companies where they need help. When we started this business, Altaser was the only independent machine shop creating aerospace parts. Today you can see many, and all others are foreign companies. Mexican companies should not be discouraged from entering this sector, because I can confidently say that the return on investment will be double the initial expectations. •

Sergio Mancinas

Director
FABLAB INTERNATIONAL TECHNOLOGY

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 PROCEI, which is a cooperation program between the European Union and Mexico under the management of ProMéxico and promoted by Desarrollo Economico del 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 area. 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 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 industrial property of its customers, and we work with: Soisa Aerospace, where FabLab has been supporting design fabrication of tooling and sheet metal parts; Kaman Aerospace for design fabrication of tooling; Zodiac Aerospace, providing threading inspection and dimension for detailed parts; Fokker Aerostructures, including sheet metal parts details for shop aids and testing parts for wing assembly; and Altaser 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, Tighitco and CAV Aerospace, Arnprior, Chandler Industries, L3, Textron, Beechcraft, and others. FabLab has the expertise and machines to support the aerospace cluster in Chihuahua and Mexico.

Can you detail the capabilities of FabLab's machines?
FabLab has sophisticated CNC, punch-press machines that can punch up to 6-millimeters thick material in aluminum, mild steel, and stainless steel. The machines have a turret auto index with a multi-tool design feature for quick changes, facilitating a more efficient cycle time. The CNC has the capability to cut, make pockets, slots taping, countersink, special forming, and bending material up to 3" high, all by one machine.
The CNC press-brake machine is able to bend parts to eight different axes; the laser can calculate the spring-back of different materials, i.e. stainless steel or aluminum. The software for spring-back is specific for the thickness of each material. The company also has a replica center machine 3+2 axes; it will take a single part through machining in five faces without having to take the part out of the machine, and the machine table rotates 360 degrees.
Additionally, we offer reverse engineering procedures: the measuring arm has a laser that scans a part for a template and quickly digitizes a part or object to create a replicated tool, particularly helpful to the aerospace companies who require tools where the original drawings are no longer available. It also provides three-dimensional computation and accurately identifies dimensions that are out of tolerance from the original parts. FabLab's machine service offerings service the aerospace, automotive, and electronics sector, but our objective for 2016 is to further increase services to the aerospace cluster in the reverse-engineering and sheet metal parts details fabrication.
Currently, the greatest demand from the aerospace sector is for tooling design expertise.

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 would 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 sheet metal parts fabrication. The region has the capabilities of becoming a worldwide hub in research for advanced materials and composites like Centro de Investigation en Materiales Avanzados (CIMAV).
A priority for FabLab is 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. •

Dr. Juan Méndez Nonell

Director General
CENTRO DE INVESTIGACIÓN EN MATERIALES AVANZADOS (CIMAV)

Please provide a brief introduction to CIMAV and its role in Chihuahua's and Mexico's aerospace sector.
CIMAV 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. CIMAV in Chihuahua was created in 1994; it is one of 27 research centers throughout Mexico covering different topics and is arguably one of the best in the country, annually producing academic standards of excellence equivalent to any research center for material science in the world. Within material science, CIMAV is involved with industries such as aerospace, automotive, pharmaceutical, and electronics. In Mexico, 25% to 30% of CIMAV'S work is dedicated to aerospace in improving products, processes and performance of materials.

Why was Chihuahua chosen to house the headquarters of CIMAV?
CONACYT decided 25 years ago to create a research group specifically devoted to advanced materials. The rationale behind CIMAV's choice for Chihuahua as headquarters was local government support, i.e. land allocation, its strong nucleus of industry, and its geographical location, since there were not any research centers already in the northwest of Mexico.

How does CIMAV contribute to the aerospace sector in Chihuahua?
CIMAV has around 50 new projects annually that permeate from CONACYT; around 30% are directed towards aerospace. For example, in 2012, CIMAV developed a software application that supports commercial aircraft harnesses for Labinal, doubling its production and growth in Chihuahua by alleviating its need to transfer production to another country. Six years ago, CIMAV began projects with the U.S. Air Force; the program has been renewed annually and has serviced a total of 12 projects. Additional clients include Altaser Aerospace and Honeywell.
CIMAV'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 magnetism 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 dispersion, enhancing its characteristics and 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 polyurethane foam for aircraft cushions; and software design development support for harnesses in commercial aircraft. The aerospace industry wants materials that are lighter, stronger, and flameproof; it also wants further research on the usage of aluminum, polymatrix, and light metals.

What are CIMAV's plans for expansion?
As part of a five-year plan, CIMAV is building additional facilities for the aerospace industry at its Chihuahua premises that are due to be completed in 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, new equipment for chemical analysis and nuclear magnetic resonance, and 3-D machines. •

CROSSCHECKING COLLABORATION WITH INNOVATION IN CHIHUAHUA

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

Image: Zodiac Aerospace

Chihuahua is testing our comfort levels, as the formerly maquiladora-centric aerospace hub breaches 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, which means that Zodiac Seats must tailor dedicated programs for each machine that corresponds with creating each piece. Being highly vertically integrated, Zodiac Seats Chihuahua transforms raw materials into finished parts according to the demands of its customers. Nearly half a million parts 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 meets the requests of the airline 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 the success of the project on the facility's creativity with current manufacturing ability and rapid prototyping.

SOISA's contribution has been in cushion and dress cover development, which also follow a user-centric methodology. "We began incorporating new materials into the seats to produce a unique, higher quality product…this testing culminated into the composite-laminated material we use today," explained Fernando Wong, new projects research and development manager of SOISA.

This newly developed composite is more flame-retardant, comfortable, and durable; the patent is currently pending. SOISA is also working with local research and development institutions to develop a more environmentally friendly, water-based adhesive that does not require a solvent for fabrication.

Utilizing ULSA's ergonomics and biomechanics laboratory, a team of researchers studied passengers' sitting experience in an eight-and-a-half-hour flight simulation to analyze user satisfaction of the seat. Participants are placed into a mock cabin for the duration of what would be the route from Dallas to London, and four variables are measured: psychological behavior, physical behavior, blood pressure, and body pressure mapping. Every two hours, the test subjects were interviewed individually about their experience and levels of irritability. From this study, it was concluded that the laminated, composite material brings greater comfort, allows more relaxation, as well as increased blood-flow to the passengers.

SOISA's dedicated research and development branch continues to work on adding variables to its testing and incorporating results into new seat models, which are then proposed to the renowned international majors, such as Zodiac Aerospace, in hopes of securing their support.

ULSA's collaboration with Zodiac Seats has also been through the conceptual and technical development of sub-systems, utilizing their facilities and calling on students' creativity through their technology transfer and development programs. Presently, a group of students is working with Zodiac Aerospace in the United States, where there is more opportunity to be involved in the established research and development branches of the company. With the transfer of knowledge, as well as the leadership of Chihuahua's plant managers, design labs in Mexico will become more commonplace. "There is a lot of investor confidence that Chihuahua will become a center for design on a global scale," argues Jaime Luciano Fernández, director of outreach for ULSA.

As Zodiac Aerospace adjusts their seats for innovation and creates an ambiance of design in the region, other international aerospace majors will hopefully be comfortable in doing the same. •

Ing. Fernando Wong

New Projects Research and Development Manager
SOISA AEROSPACE

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 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 shutdown its operations in 2004. 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. In 2008, SOISA became AS9100-certified, and was 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 experience with the commodities related to sewing and its processes, the change to producing airplane parts was efficiently creative.

Part of their vision was to assure that SOISA Aerospace had a certified quality system and focused on customer satisfaction with flexibility and rapid responsiveness. Even without yet having any orders, obtaining the AS9100 certification was an important step in capturing their new market and bringing SOISA Aerospace to where it is today.

What were the first pieces created and sold by SOISA Aerospace?

In 2008, we started making canopies for the slide rafts of Zodiac Air Cruisers. SOISA was purely a cost center manufacturing 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 we began sewing seat covers. The main materials, i.e. the leather and the fabric, were received from the airlines, but in 2011 SOISA began looking for better, local means of sourcing, consolidating a stronger supply chain and processes integration adding value to our customers.

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, R&D, certifications, and supply chain management along with the product manufacturing, SOISA integrated institutional partners such as CIMAV (Advanced Materials R&D Center) and Universidad La Salle Chihuahua—we began incorporating new materials into the seats to produce a unique, higher-quality product, moving past the seat-covers to the entire seat and cabin. This testing culminated into the founding of SOISA's Research and Development Department, and the composite-laminated material we use today for seat covers that enhance flame retardant capabilities, comfort and apparel. The integration process of the composite materials is patent-pending. Currently, SOISA is working in collaboration with CONACYT to develop a more environmentally friendly, water-based adhesive, which avoids needing a solvent in the fabrication process.

In 2014, with the university's collaboration, SOISA established an ergonomics and biomechanics laboratory 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 three thousand people. As well, SOISA has a rate of national integration of 58% over the average rate of 3% of the transnational exporting industries in Mexico.

In 2011, SOISA decided to integrate machining into its search for integrated fabrication of parts for seat structures but ended up creating parts for turbine engines 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, Altaser, which successfully entered the aerospace market. Altaser machines parts for Honeywell and other multinational conglomerates in Chihuahua. As a part of this spin off, SOISA created another company named HTMX for heat-treat processes as well, selling part of the business that had emerged from our development to a local company to take over.

Are there opportunities for Mexican companies to be involved in interiors?

Certainly. We are developing Mexican suppliers in the realm of seats materials—for example, cushions—giving them guidance on what constitutes a quality system, the tests necessary (i.e. flammability, toxicity) and the laboratory approvals needed for accreditation. •

JLF

Norma Ramírez & Jaime Luciano

NR: General Director
JLF: Director of Outreach

PARQUE DE INNOVACIÓN UNIVERSIDAD LA SALLE CHIHUAHUA (ULSA)

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's creation. 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 more 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 for students 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 ULSA operates in accordance with the industry's needs?

NR: Every year, we change about 5% of our program to update courses according to the industry. For example, in industrial design, there are five plant directors tasked with permanently revising the program and informing us on how the sector is evolving outside of the university's walls. We do everything possible to ensure that our students are well prepared to face jobs tasked to them once they are trained members of Chihuahua's workforce. Our career counselors consistently provide feedback on what new equipment we should be seeking for our laboratories, as well as engage in agreements with companies to allow students to use their facilities.

JLF: Companies also task our students with real projects, such as Zodiac Aerospace requesting a design for their global trade fair stand, or coming up with a product for an impending trade show. These are substantial tasks that will have a real impact.

How would you rate Chihuahua as an educational hub for the aerospace industry?

NR: There are at least four institutions with explicitly established roles in the aerospace cluster and each of them selected a different, relevant focus area. Overall, the shortage of engineers allows for Chihuahua to serve as a reinforcement hub for human capital, as our training is among the best in the country. ULSA's students are being recruited not only from Chihuahua but a multitude of aerospace-dominant states. The quality of new Chihuahua professionals provides a significant boost for our aerospace cluster. Even Querétaro, which has a large industrial demand, likely does not have a paralleled advantage in skills.

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

NR: The LaSalle 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 the university. For example, we are the only university that owns a solar farm that has 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 private sector to re-structure our laboratories to created a shared focus in the realm of design. •

SUPPLY CHAIN STATUS

Working to Fill the Gaps

Image: Palomino

Chihuahua is not exempt from the inverted-pyramid supply chain challenge common among other Mexican aerospace clusters. "Mexico continues to develop its capabilities from initial design to the manufacturing of the parts and is already looking into how we can adopt the latest technologies. What still needs to be developed is a stronger supply chain within the country. Developing a local supply chain would create an immense amount of opportunities for aerospace joint ventures," noted Ramírez of EZ Air Interior Ltd.

Yet developing a local supply chain is not easy. Most international companies already have solidified, fixed suppliers, and, even though it is more expensive to continue using foreign entities, the risk uncertainty poses is a much greater cost. Zodiac Aerospace, which houses its largest facility in Chihuahua, is exemplary of how capable multinationals can make strides towards flipping the pyramid in a mutually beneficial way. Soisa Aerospace, an entirely local, family-owned company, was initially contracted by Zodiac Aerospace to make canopies for their Air Cruiser slide rafts. "Once we have developed a supplier for one operation, we can be creative on how they can help with other projects," explained Baptiste Valois, general manager, Zodiac Aerospace Eqiupo de Mexico.

Shortly after, Soisa Aerospace began sewing seat covers for Zodiac Aerospace, and is now integrated in ergonomic seat design. 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 cabin may be redesigned every five or seven 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 combustion engines 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 Palomino, director of operations at Palomino. "One of the most significant being the culture this implied...there is no shortcut when it comes to entering the aerospace industry."

By March of 2016, Palomino expects to be certified in ISO9100 Quality Assurance, ISO14001 Environmental Management, OHSAS18001 Occupational Health and Safety standards, and SA8000 Social Accountability. Palomino aims to be involved in the complete process of designing and fabricating tools and small parts once they are AS9100 and Nadcap certified.

Across the value chain, nearly all executives say they would prefer to develop local suppliers, though it is impossible without the support of their respective original equipment manufacturer clients. Funding for start-ups to achieve certification is minimal, hindering local entities from taking that first leap. "The cost and the time needed are the largest barriers, both of which are much more demanding than other industries," said Espinosa.

The cluster continues to look for companies that will complement what Chihuahua already has established; notably, there is an organized precision in the way the cluster is working to invert the supply-chain pyramid. "We all play a part in developing the Chihuahua aerospace industry…Every company here contributes to the image of this region, and it is important we all share the vision that everything Chihuahua produces must be done right," explained Luis Rivero, managing director of Wesco Aircraft Chihuahua.

In accordance with their multipronged strategic vision and technological roadmap, the cluster's main target is building a raw materials distribution center. Presently, nearly all of the parts and materials needed by the industry are imported from the United States and only 3% are sourced locally. •

Luis Rivero

Manager of Business Operations
WESCO AIRCRAFT CHIHUAHUA

Can you give 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, electronic products, customer-designed products and tooling, and also provide value-added services like quality assurance, just-in-time delivery, point-of-use inventory management, and kitting.
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 equipment manufacturer customers in the area. We moved to a new 45,000-square-foot facility in 2015 to accommodate this growth.

What new innovations does Wesco Aircraft Chihuahua offer, and how does Wesco Aircraft best accommodate immense customer 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 storage 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 experience greater efficiencies as our relationship with them grows.

Does Wesco facilitate the process of importing raw materials?
Wesco Aircraft uses its expertise in inventory 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 transportation to Chihuahua, thereby reducing costs for our customers.

Can you elaborate on the collaborative nature 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 sustainable 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 indispensable 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 overhaul sector. Developing interest and getting people involved in the training and certification process is essential.

What technologies have improved supply chain management and helped mitigate issues?
Significant advances have been made in real-time connectivity. Real-time data and inventory analysis tools are needed 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?
With the 2014 acquisition of Haas Group International, a premier chemical management services provider, we have a great opportunity to support chemical product and service needs. We are already an established service provider to the Mexican automotive industry, with over 300 employees supporting various 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 international readership, those looking at Chihuahua as a potential aerospace destination?
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. •

Luis Alberto Palomino & Carlos Alonso Palomino


LAP


CAP

LAP: Director of Operations
CAP: General Manager
PALOMINO HIGH PRECISION MACHINING

Can you provide a brief history of Palomino High Precision Machining and its current operations?
Palomino started in the 1960s when our grandfather, Octavio Palomino, took out a loan to buy two grinding machines. He initiated the business with just two technicians, repairing gas and diesel engines.

Capable of servicing a diverse array of sectors, what machines and expertise does Palomino provide and how will that translate into filling a gap in the aerospace supply chain?
Palomino has now been in the market for about 50 years, servicing the construction, transportation, mining, and automotive industries. Currently, there are two business units within the company: combustion engines machining and industrial CNC, high-precision machining.
Over the last three years, Palomino has invested in state-of-the-art equipment such as: CNC machine centers, wire EDM, sinker EDM, and a quality-assurance lab. We are also training a group of 18 engineers and technicians capable of designing and fabricating tools and parts with tolerances close to a ten thousandth of an inch.
Our technical staff is consistently being trained in the latest CAD/CAM software and ISO standards. Nowadays, Palomino has 11 new machines in the CNC machining division and 23 machines in the engine machining division.
CANACINTRA, along with the Secretary of Economy of Chihuahua, invited us to be part of the new aerospace MRO cluster. Soon, Palomino will also have new and bigger facilities to operate in, with additional specialized processes, engineers and technicians.
Presently, our machines include: Makino F5, 30,000 rpm; Sodick SL600G, six-axis; Doosan DNM500 II/Renishaw, four-axis; Doosan MYNX 7500/Renishaw, four-axis; Doosan LYNX 300; and Rottler F99Y.

As a third-generation family business, what challenges did Palomino overcome to establish itself as a locally owned and operated aerospace supplier?
The idea of breaking into the industrial machining sector was conceived about three years ago when our customers began demanding rebuilding parts and mechanical components in addition to engines. The decision to increase our market from an automotive supplier repairing gas and diesel engines to a multi-market supplier in the local manufacturing and aerospace industries brought a great deal of challenges. One of the most significant being the culture this implied. Palomino is not trying to compete against local suppliers; Palomino is competing against itself. A secondary challenge is finding qualified engineers and technicians. But, the state of Chihuahua has plans to keep multiple aerospace companies running for the long term, which we consider an advantage for our business.

What was Palomino's process in securing the necessary funding and quality-assurance measures? Were there any government programs or initiatives involved?
Palomino has received local support from INDEX Aerospace Cluster, which enabled the company to reach some of its most valuable customers, such as Honeywell Aerospace, EZ Air Interiors, and Textron International Mexico. However, there is no shortcut when it comes to entering the aerospace industry. We hope that in two years we will have grown our staff from 18 to 42 people. Proudly, all our employees are from Chihuahua.

What certifications is Palomino trying to acquire?
Last year, we became involved in a program managed by CANACINTRA, consisting on the implementation of multiple ISO standards. By March 2016, we expect to be certified in ISO9001 Quality Assurance, ISO14001 Environmental Management, OHSAS18001 Occupational Health and Safety standards, SA8000 Social Accountability.
One of Palomino's short-term goals is to pursue AS9100 and NADCAP certifications. Becoming an aerospace-certified supplier, we will become 100% involved with direct design and fabrication of aerospace products, rather than indirect machining suppliers with products such as carbide cutters and tooling, inspection gauges and fabrication of injection molds. •

Sergio Almada

Marketing & Business Development Manager
INTERMEX INDUSTRIAL PARKS

Can you give a brief introduction to Intermex and its role in attracting business to Mexico?

Intermex was established in 1971 as a real estate business, developing industrial parks for those taking advantage of the Maquiladora Industrial Parks program (IMMEX). IMMEX encourages the establishment of foreign companies in Chihuahua by a governmental non-tax policy of production inputs and assets, provided that the manufactured goods are exported out of Mexico. Intermex not only covers Chihuahua, but has followed its customers to other industrial facilities in Mexico, e.g. Juarez; Guadalajara; Querétaro; Reynosa; Monterrey; Durango; Hermosillo; Silao and Valle de Santiago, both in the state of Guanajuato; and Mexicali. The company is continually looking to expand and has recently acquired additional land in the Bajio region. Intermex has 6.6 million square feet (sq. ft.) of industrial space, of which 6.1 million sq. ft. (92%) is leased. In the late 1980s, Intermex extended its service offering to provide support services for manufacturing, and recently the company added logistics to its portfolio, i.e. temporary warehousing, just-in-time deliveries, and vendor managed industries.

How much of the Intermex's 6.6-million sq. ft. industrial space is located in Chihuahua, and how does the company attract aerospace to the state?

Approximately 24% (1.6 million sq. ft.) of our total industrial space is located in Chihuahua, which is primarily devoted to aerospace. Cessna occupies 0.5 million sq. ft. of leased space in Chihuahua alone. Chihuahua's historic expertise in wire harnesses attracts the aerospace sector to the state, coupled with a stable labor force whose salaries stimulate productivity. Cessna is a great example of a company that has substantially developed itself in Chihuahua from cable assembly through to structural parts and composites. The state also greatly supports the aerospace sector via its academic undergraduate programs for engineering, management, and vocational schools, which is a key ingredient in attracting aerospace to Chihuahua.

In addition to Cessna, who are Intermex's other aerospace clients in Chihuahua?

Additional aerospace clients include Lisi Aerospace and Bell Helicopters, who take the company's service offering of shelter and real estate; Cessna is solely real estate. Embraer's joint venture with Zodiac, EZ Air Interiors Ltd., has an American Industries shelter but is leasing an Intermex building. Currently, Intermex's business with Honeywell does not include the aerospace sector, albeit Intermex did supply the facility for its new engineering design center for automotive and electronics at the close of 2015.

Can you elaborate on the readiness and availability of logistical support?

Over the course of the 40-plus years that we have been established, Intermex has built a wealth of expertise in logistics operations. We can recommend how to best handle situations specific to Mexico, which is standard practice for Intermex's shelter customers to receive our logistical service offerings, which includes different freight providers, custom brokers applicable to specific markets, and the best strategy relating to labor unions.

Are there any specific needs atypical to the aerospace sector in Mexico, i.e. regulations and approvals?

There are customs regulations that apply specifically to the aerospace sector in Mexico, and Intermex fully understands and utilizes these regulations. Freighting also carries distinct regulations, i.e. for shipping helicopter cabins from Chihuahua to Montreal-Mirabel International Airport, Canada, special crating and conditions for transportation are required. One extremely helpful measure implemented by the federal government allows aerospace companies in Mexico to import all parts for aerospace under one classification with no duties. Intermex also works with its customers to make sure that the correct compensation and retention programs are in place, as it is essential to keep turnover rates low.

What role do you see Chihuahua playing in Mexico's aerospace industry overall?

Chihuahua's current role in Mexico's aerospace industry is its wealth of expertise for aerospace structural parts for assembly and fabrication. Looking forward, as this critical mass grows, more support processes will be required for multi-structural parts, such as surface treatments. Under the just-in-time category, the supply of raw materials (i.e. aluminum and other hard metals), should be advanced by local suppliers. The next aerospace chapter for Chihuahua is to have the capabilities of manufacturing an entire aircraft; a prelude to that would the complete manufacturing of a helicopter.

How does Intermex Chihuahua hope to grow over the next five years?

As an industrial developer, Intermex is always seeking land reserves with strategic locations in specific markets. Land is still available for aerospace in the region, ranging from small projects, 100,000 sq. ft. to 300,000 sq. ft., to larger projects, 40 acres of land reserves in the north of the city, for future development. Other locations within the south of Chihuahua city are on our agenda.

Do you have a final message?

Intermex is a facilitator who works with foreign companies through the A-Z of establishing a presence in Mexico. This includes: site selection in different cities with an outline of total operating costs including leasing, payroll, insurance, building maintenance, shelter fees, etc. Once visited, Chihuahua is unanimously considered the perfect destination for the aerospace industry. Success thus far can be measured by the fact that shelter terms are consistently renewed—Bell Helicopters has renewed shelter terms with Intermex since 2009. •

ESCALATING CAPABILITIES

Aerostructures, Machining and Beyond

Fokker Aerostructures, Arnprior Aerospace, Lisi Aerospace, Kaman Aerostructures, NORDAM, Zodiac Aerospace, Tighitco, and Metal Finishing Co. (MFCO) are a few of the most prominent names contributing to Chihuahua's specialization in craft components for aerostructures, interiors and machining. Most operations are highly vertically integrated—for example, Fokker Aerostructures is assembling aerostructures with the use of compressors, painting, finishing, polishing, applying seeding and chemicals, etc. all in house—and waiting for additional responsibilities to be implemented from headquarters.

In regards to adapting to aerospace's future in composites, Fokker is one of the first to bring composite assembly to Chihuahua. "The first step is to familiarize people with the material," said Rodríguez, operations director of Fokker Mexico. "Next comes the knowledge acquisition and regulation of handling, painting, and application. There is a lot of intensive labor that coincides with this process, which we can handle both efficiently and affordably in Mexico."

Those further down the production line have a similar perspective: "L3's capabilities are based on sheet metal, but we are not limited," said Alvaro Aguilar, general manager of L3 Crestview Aerospace Chihuahua. "We have the intention to work on composite materials and plastics as these capabilities reside in our parent plant."

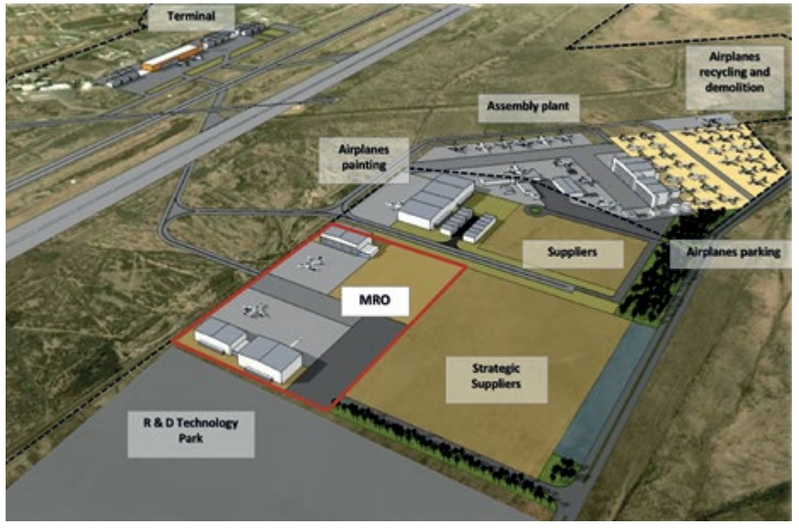
L3 Chihuahua specializes in sheet metal, including stretching and forming processes for aluminum extrusions. Conveniently, MFCo is located next door to their facility, readily able to provide the subsequent special processes. MFCo is approved by Cessna, Boeing, Bombardier, ETAS, Bell Helicopter and recently HondaJet, offering various anodization processes, chemical film and chemical conversion for sheet metal parts, Non-Destructive Testing (NDT) and heat treatment. MFCo Global offers ultra-sonic inspection. "The aim is to transfer the entire service scope of MFCo as a company to the Chihuahua facility, but currently we need to follow the industry trends," said Espinosa, plant manager of MFCo Chihuahua.

The first in the region to offer sheet-metal fabrication is Tighitco. General programs manager Héctor San Martín explained: "The whole aerospace sector in Chihuahua is developing, and competition is increasing in sheet metal, harnesses, and special processes." There is a need for companies to further diversify their offerings in materials. Chandler Industries is a machining company that is still relatively small in size, but already offers processes in steel, aluminum, stainless, brass, nickel, titanium, and super alloys, and has added lapping and polishing as a means of differentiation. It is only a matter of time before Chihuahua becomes an all-encompassing hub of sheet metal processing and finishing.

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 workshop will offer services to the whole aviation maintenance market in the south of the United States," expounded David Dajlala, delegate for the Secretary of Economy of Chihuahua.

The government has been collaborating 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 airport infrastructure, such as an research and development (R&D) technology park and cheap, reliable energy. At the beginning of 2016, a new combined-cycle gas turbine is to be 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 process in the country, Chihuahua is primed to welcome new business to the region," said Dajlala.



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 painting and parking centers at the airport, which are expected to be complete by the end of 2016. •

Rodríguez Ramos

Operations Director
FOKKER AEROSTRUCTURES MEXICO

Can you provide a brief history of your involvement with Fokker Aerostructures and how the company has evolved in Chihuahua?
A main component of my career has been launching aerospace and automotive companies for the past 25 years, and I have always had a clear vision of further developing aerospace in Chihuahua. Fokker Aerostructures is based in the Netherlands and, with the desire to further expand its presence in the Americas, Mexico was deemed the premier location for manufacturing facilities in 2010. Fokker creates large aerostructures, so transportation is an important cost. Chihuahua city is close enough to the U.S. border that it is both logistically sensible and far enough away from the noise of an international border. Time is a logistical measure as well, and Chihuahua is in the same time zone as many of our customers. In Fokker's 2020 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 knowledge can be transferred from high-volume techniques and industry expansion planning from that sector. Presently, Chihuahua has four original equipment manufacturers (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 which are expected to be completed by 2020. Our facility is 80,000 square feet (sq. ft.) but will expand to 360,000 sq. ft. Cessna, which is now Textron Aviation, was our first customer in March 2012. Fokker Chihuahua constructed the empennage for three of Cessna's Citation business jets, and our latest awarded projects include contracts with Gulfstream and HondaJet. The new HondaJet aircraft is now certified for flying as of the last week of 2015, and we are greatly anticipating the ramp up in production from our plant. Many of the new aircrafts deal with composites, and Fokker Chihuahua wants to participate in implementing that new technology in time. Right now, we are assembling aerostructures with the use of compressors, painting, finishing, polishing, the application of seeding 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 IS9100 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?
Now that 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. We have relationships with local companies, such as Tighitco for aluminum, and are actively helping to develop Altaser, a small-components and complex-tooling company that originated in Mexico. Universities, such as the Tech de Monterrey, are working to establish small businesses from which Chihuahua's aerospace industry can both grow and benefit. We are working closely with 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 consortium concept. 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. To what would you attribute its success?
Chihuahua has its own version of the three national development phases: an industry diagnosis, a roadmap with points on the best direction to move, and a strategy how we can best promote ourselves as an attractive destination for international investment. Chihuahua's public-private sector 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 keep our future technicians and engineers excited about where this industry is going. Chihuahua is strong in terms of aerostructures and interiors, but it is worth noting that a majority of the total aircraft parts are manufactured here. •

HSMB

VPC

Héctor San Martín Benavides & Victor Prieto Cano

HSMB: General Programs Manager
VPC: General Manager
TIGHITCO AEROSTRUCTURES CHIHUAHUA

Please provide a brief introduction to TIGHITCO in Chihuahua and how the company has evolved since its establishment.
HSM: TIGHITCO was established in 1946 in the United States, and has facilities in Connecticut, Charleston, and Atlanta. In 2001, TIGHITCO realized a presence in Mexico at San Luis Potosi with a service offering of composites and insulation products. In September 2008, TIGHITCO's facility in Chihuahua was opened for low-cost sheet metal fabrication and assembly operations, with one machine and four employees; today, it has over 200 employees and a plethora of machines.

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.
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 generic machinery for sheet metal: cutting processes for three-axis and four-axis, computer-numerical-control routing, manual tools for deburring, brake presses, and a hydroforming 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 2008, there were 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 sectors.
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 have significantly helped to 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?
VP: Chihuahua is developing into a hub for sheet metal fabrication and assembly; it fulfills the demands of OEMs in the region and is supported by strong training programs.
HSM: The company has no plans to introduce its sheet metal products outside Chihuahua; however, the government may begin to encourage expansion outside Chihuahua to other locations in Mexico that have aerospace clusters.

Do you foresee collaboration between other aerospace companies and TIGHITCO for new materials in the aerospace sector?
VP: TIGHITCO is collaborating with its sister company in Mexico and its U.S. facilities to develop different components. In this project, their integration will complement the enormous assembly plants of our main clients.

Where do you see TIGHITCO positioned in the market in two to five years?
VP: Future goals for TIGHITCO will be to maintain the company's growth and its position as market leader. TIGHITCO is robust, and it foresees growth for at least the next five years; albeit, this will be dependent on the economic status of OEMs in Chihuahua. The aerospace cluster in Mexico will continue its integration of the supply chain.
HSM: OEMs are looking for the most cost-effective options, and Asia is a region that could be a future competitive threat for the American aerospace market. TIGHITCO is striving to create a link with the largest Latin American OEM to further stimulate growth and combat Asian competition. Space for further expansion is available within TIGHITCO's Chihuahua facility; arguably, over the next three to five years, there could be a second building within the complex.

Do you have a final message for our international readership, those looking at Chihuahua as a potential aerospace destination?
VP: Come and see TIGHITCO in Chihuahua. The aerospace industry is impressive, with a high level of expertise and comprehensive cluster support.
HSM: Chihuahua has the infrastructure to support the aerospace industry. It has a safe environment, and the local people are friendly. We look forward to welcoming companies to the region. •

Alvaro Aguilar

General Manager
L3 CRESTVIEW AEROSPACE CHIHUAHUA OPERATIONS

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 of enhancing competitiveness. Considering we already had a customer in the region, Chihuahua was an ideal location, and the city is particularly focused on aerostructures when compared to other Mexican regions. Another motivation was that sheet metal operations require special 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 secure business from the original equipment manufacturers (OEMs), as well as more onsite support for machine maintenance. 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 machines, 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 companies 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 facility with stretch-forming capabilities in Chihuahua. With all of our equipment, we are able to produce machining parts, aluminum-sheet metal parts, and finished parts for any type of aircraft.

Where does L3 source its supplies, and what is your assessment on the local supply chain?
Since our operations are based on aluminum and sheet metal, we have a small number of suppliers. All supplies are currently 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 conglomerate the supply and demand of several companies so that the inventory investment makes sense. It is easy for a maquiladora to obtain an Immex permit, and there are many tax return benefits. The gap in the local supply chain offers many opportunities for investors.

Where does L3 source its employees, and what is the size of the current operations?
L3's operations are relatively new as we initially started production in March 2015. We are a small team with about 30 people, of which the majority are engineers. There are not many operators on the team, as everything is centralized around establishing the systems and processes. The Chihuahua market offers an abundance of skilled engineers as a result of the city's rich history. Cenaltec, a local institution, is an excellent training center and a good baseline to source employees. The institution will receive 40 to 50 operators at once, train them for three months and then deliver these operators with sheet metal operator certifications. One has to continue with training within the company, but the presence of these institutions adds an additional perk to Chihuahua as a destination.
Once L3 acquired its own experience in operator management and process management, we could provide in-house training, but together with the aerospace cluster, the technical schools were able to adapt their curriculum as to have specializations. L3 relies on relationships with technical schools for our recruitment of technicians, as they understand the requirements of the industry and provide hands-on training with similar equipment.

What is L3's role in the further development of the aerospace in Chihuahua?
The vision is to offer the aerospace market critical parts at a competitive cost, all the while ensuring the highest quality and on-time delivery. The expertise of Crestview Aerospace, which is our parent plant, is very extensive, and their technical support can help L3 make a difference in the 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 plant. 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 survive. To achieve sustainable growth, we operate as an independent company from our operational branch. The main difference is that we are a profit center and not a cost center.
Our sheet metal cutting and forming capabilities will continue growing for the entirety of 2016 and beyond. We are already in conversation with potential customers that require other techniques and technologies, forcing us to update our operations and offerings according to the latest demands of the industry. The timeline to start our new operations will take about 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. •

Rene Espinosa

Plant Manager
METAL FINISHING CO. CHIHUAHUA (MFCO)

Having opened in Chihuahua in 2011, can you provide a brief history of MFCO's presence in Mexico and how it has since evolved?
Established in 1940, MFCO is a family-owned business that specializes in chemical processing and, as mentioned, our Chihuahua operations commenced in 2011. We are the largest privately owned aerospace processing company in North America and also maintain the most special process approvals for Boeing and other aerospace original equipment manufacturers (OEMs). The Chihuahua facility occupies 60,000 square feet of floor space with room for growth.
MFCO prides itself on being a one-stop shop solution for its customers, as it specializes in non-destructive testing (NDT), surface finishing and plating. Heat treatment capabilities were also added to our scope of services within the last two years. We are the first independent aerospace processing company on the continent to offer a wide array of both chemical processing and heat treatment solutions to third parties. We are NADCAP- and Boeing-approved for steel and aluminum heat treat in the United States, and our Chihuahua facility is in the process of obtaining approval from Bell Helicopter and Boeing for aluminum heat treat. Our establishment in Chihuahua and the services that we provide is a success story for the city, as we contributed significantly to fill a gap in the local supply chain.

What was the incentive for MFCO to establish a facility in Chihuahua?
Beechcraft moved a significant portion of its operations to Chihuahua and focused on assembly. Though it produced most of its structures 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 are currently working on future approvals for products that Bombardier is aiming to bring to Mexico. Most of their aerostructures are imported, but approximately 85% of the few that they buy in Mexico come from Chihuahua.

What differentiates MFCO in the market?
The way that MFCO handles customer service gives us a great advantage. There is a significant amount of close communication with our customers and we try to really understand their needs. By implementing efficiency programs, we gain more capacity and we can also reduce costs for our customers. MFCO decided to diversify with OEMs, which created a large customer base. Some of our customers are vertically integrated and have internal special processes, but they will still outsource some services to MFCO as we have the expertise, the capacity and the certifications. Another key differentiator is our ability to be a one-stop shop for all of our customers' processing needs.

What on-time and quality-control measures does MFCO have in place?
MFCO 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. By way of thorough communication and mutual customer-business understanding we were able to close 2015 with 98% on-time delivery. According to the delivery agreements, representatives will make sure that processes occur on time. All orders are inspected, counted, photo identified, 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?
Chihuahua's facility has a NDT process line where we inspect all parts for cracks and damages as required. Our hybrid line for chemical processing has three different types of anodization processes, and chemical conversion for sheet metal parts. Passivation capabilities will soon be added to the hybrid line, hopefully by the close of 2016. We also have a skilled masking department; masking is a very artisanal and critical process, requiring sensitive and precision work. In addition, our internal certified lab offers chemical testing, and MFCO has the capability to fabricate its own equipment and undergo blasting processes.
MFCO currently ships an average of 3,500 pieces a day, which only accounts for about 70% utilization of its current capacity of its first shift. Most of the parts that we process go to local Chihuahua suppliers. MFCO Chihuahua's greatest demand lies in anodizing aluminum, chemical conversion, primer, top coats, teflon and masking for electrical bonding—the core processes of the Mexican aerospace industry. Aluminum heat treat, aging and straightening capabilities will be added in 2016, following the trend of how the industry has been transferred into Mexico. Integrating steel processing into our operations will be the logical next step.
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 we need to follow the industry trends. Six months ago MFCO decided to add aluminum heat treatment that will be ready for operation soon. As the industry expands with regards to steel, we could eventually install heat treatment for steel. •

TARGETED EDUCATION AND THE FUTURE OF CHIHUAHUA'S AEROSPACE INDUSTRY

As Chihuahua's aerospace cluster expands, the need for an equipped workforce will grow accordingly. Over ten universities 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.

Fundacion CIDAC, in collaboration with the United States Agency for International Development (USAID), published a study in 2014 reporting on the mismatch between taught skills and actual needs. In Chihuahua, high school training programs were outdated, making the developed skill-sets non-transferrable outside of the classroom. These findings, along with intelligence provided by local industries, sparked the creation of Programa Rutas, which aims to retarget youth into available job vacancies by recalibrating existing curriculums, once the pilot class graduates in May 2016. "Many people forget that while there is certainly room for engineers in the aerospace sector, the vast majority of the positions available are technical. We want to equip individuals so they will find work, so it is necessary that there be dialogue between the public sector, the technical high schools, and companies," said Jorge Barragán, director of Programa Rutas.

After the initial establishment of major OEMs in Chihuahua in 2005, a technology-training center, Cenaltec, was created to address the immediate skill deficit for CNC machining, sheet metal assembly, and structural assembly. To date, nearly 4,200 students have passed through Cenaltec's programs. Though there have not been drastic changes in regards to training necessities, the pull to continue experimenting with more advanced technologies seems to draw from an eager anticipation of what is to come from Chihuahua: "So far in Chihuahua, Fokker Aerostructures, NORDAM Aerospace, Zodiac Aerospace, and EZ Air Interior Ltd. are working with composites, which is why Cenaltec is considering moving towards those types of courses," noted Alberto Salomon, director of Cenaltec. "Last year we bought an electrical discharge machine that has six-axis movement. Even though no one has asked for it, we want to be competitively prepared," added Ramiro Cedillo, a professor at the school.

Image: Universidad Politécnica de Chihuahua (UPCh)

Realizing the supply-chain problem, educators are trying to fill the gaps by fostering an entrepreneurial spirit: "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," explained Dr. Antonio Ríos Ramírez, director of Chihuahua's Parque Tecnológico.

The Parque Tecnológico was built as a campus for Tec de Monterrey, but also to connect companies related to software, automation and electronics to the aerospace and automotive industries. Companies on site include BTEC, FabLab, and Goal Tech—a 3D printing and engineering solutions company developed by a student and incubated within the park five years ago. At present, Goal Tech is supplying both Honeywell and SAFRAN Labinal.

At the Universidad Tecnologica de Chihuahua (UTCH), a new Center of Innovation and Design for the Aeronautical Sector (CIIDA)—a result of the commitment between the Mexican President Enrique Peña Nieto and his French counterpart, François Hollande—has commenced construction. With 25 PLM of 50 PLM work stations already installed, the laboratory hopes to serve the purpose of adequately transferring knowledge from French professionals abroad. "Additionally, this center will host a delegation from the Mexican Space Agency, which will complement UTCH's curriculum with further experience and knowledge," noted Dr. Benjamin Palacios Perches, dean of UTCH.

Other universities—such as Universidad Politecnica de Chihuahua, Tec de Monterrey, etc.—see opportunities for masters level programs in the future, but the reality of the industry's demands still remain maquiladora-centric. The excitement is surely present, but currently the larger question lies in endurance and follow-through. "This industry needs to walk before it can run," posits Salomon.

Conclusion

With its main products and services being high-precision machining, harnesses, seats, aircraft parts, structures, slides and rafts, turbines and heat treatment, the volume of exports from the aerospace industry in Chihuahua exceeded $1.5 billion in exports per year as of the close of 2015. Covering more than 5 million sq. ft. of industrial buildings, Chihuahua's aerospace sector is establishing its predominance both in Mexico and internationally. Presently, three out of every ten jobs in Mexico's aerospace industry are generated in Chihuahua, a statistic that is expected to increase.

Confidence in this sector permeates every aspect of the grander picture—students, educators, government, small businesses, large multinationals—and with each interview, expansions were nodded as inevitable. "In the same way that one place can have certain characteristics that are impossible to imitate somewhere else, the manufacturing, reparation, and overhaul of an aircraft is only possible in certain places where the sum of competence, abilities, and circumstances come together to bring forth growth," said Martin Flores, director of Colegio Aeronautico (CAAMEX), "Chihuahua has that combination.". •

Dr. Antonio Ríos Ramírez

Director General
PARQUE TECNOLÓGICO CHIHUAHUA

Can you give a brief introduction to the Parque Tecnológico and how the campus has evolved since its establishment?

Entrepreneurs, the private sector, and the government all came together to develop a vision for the city of Chihuahua. We selected the aerospace, automotive and metal mechanics 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 best 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. We have no goal to enter into the manufacturing sector at this stage, as the aim is to develop beyond that.

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.

How is 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 some financial stability, 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 the projects from the automotive and aerospace industries, make the park's establishment sustainable.

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

The company Goal Tech was created, developed and incubated within the park by one of our students five years ago. Currently, Goal Tech is now a supplier working with companies such as Honeywell and Labinal within the aerospace industry.

Are you able to orient the students' efforts in incubating different business and research ideas to fill specific gaps in the market?

There are huge opportunities in the market, as there are still numerous gaps in the supply chain. Specifically, a potential business venture that needs more attention is small parts and components, as these need huge amounts of investment. Our administration is focused on determining what parts and components can be used in a startup business and then building the company from there.

What role will the Parque Tecnológico play in the overall picture of the aerospace industry in Mexico?

This park is one-of-a-kind in Mexico with regards to the entrepreneurial ecosystem present in the way it was physically constructed. The park can offer laboratories for testing, entrepreneurship programs, companies focusing on research and development (R&D), and support from the industry clusters. After a social impact survey, the Parque Tecnológico received a 0.6% PVI. Eventually we want what takes place within this infrastructure to contribute 1% to Chihuahua's GDP.

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

We try to partner with aerospace companies that grant specific research projects, mainly related to parts and components. Together with Soisa, we developed an impressive project related to the design of aircraft seats and the components of the seats.

Aerospace companies are just now starting to open up to design capabilities. The difficulty lies in that there are not enough people to supply this demand. There is a 20-year plan for universities related to the necessity of technical and professional people. Universities 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 changing demands and trends within the aerospace industry?

The Parque Tecnológico is involved in R&D for new technologies, and we try to utilize them in current projects—for example the shift in going wireless in the aerospace industry. Collaboration with other universities in terms of aerospace projects is important for increasing capabilities.

To what extent would the Parque Tecnológico hope to evolve in the coming two to five years?

The Parque Tecnológico needs to support the aerospace industry in terms of research related to technologies but also more efficient ways of assembly. We do have very good talent in that regard, and we aspire to improve engineering, testing and design. Synergy and collaboration between universities will catalyze advancements in the aerospace and automotive industries in Chihuahua. •


BPP


FRR

Dr. Benjamin Palacios Perches & Francisco Rodriguez Rico

BPP: Dean
FRR: Director
UNIVERSIDAD TECNOLÓGICA DE CHIHUAHUA (UTCH)

Can you give an overview of the university and tell us a bit about the history of UTCH's involvement in Aerospace?
BPP: The Universidad Tecnológica de Chihuahua (UTCH) is approaching its 15th anniversary since it was established by decree in the Congress of the State, which was created as a public organization decentralized from the government. UTCH has grown sustainably throughout its short history, constructing a new building each year, and our campus now consists of 18 edifices. Initially having only 264 enrolled students, continual expansion is needed to accommodate our 5,000 students. UTCH is modelled after the dual system in Germany and the alternation model in France in order to harbor close ties with industry needs. The model entails an interrelation between the production plants and education, and we have designed a flexible curriculum that adapts to the specific needs of the companies operating in Chihuahua, and graduating professionals adapt quickly into the workforce. Through site visits and internships, students graduate familiarized with how the companies function and development opportunities. Our faculty is also in constant contact with companies to be up-to-date with current knowledge and technology, allowing our students to be best 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, automobile, metallurgy, etc. We provide qualified laborers, which contributes 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 realize transformational careers.

Do you have any specific example of how UTCH has changed its curriculum to adapt to the necessities of the aerospace industry?
BPP: Our graduates have a strong presence in every company based in Chihuahua. In the aeronautical industry, 67% of the innovation and design group in Labinal, a company from the SAFRAN Group, are UTCH graduates.
FRR: Labinal, which has its design group here in Chihuahua, bases its design process on the Dassault Systèmes CATIA software. At UTCH, we offer courses in our industrial processes and other programs that teach students this software. Right now we have a new product lifecycle management program that teaches this software for use in developing projects applied to product lifecycles. In the case of Honeywell Aerospace's plant, where they are dedicated to the manufacturing of turbines and parts, we offer specialization a in precision machinery, where students gain experience in using conventional machines as well as CNC equipment. We are also the only university that has a waterjet system for cutting metals and other materials.

What changes have you had to make to adjust 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 Sector (CIIDA) is a result of the commitment between the Mexican President Enrique Peña Nieto and his French counterpart, François Hollande, to establish this center. After several negotiations led by the State's governor, Cesar Duarte Jaquez, the Secretary of Education at the federal level has decided to establish this center at UTCH. This building will require an investment of $45 million pesos, equipped with 50 PLM work stations that will allow our students to be involved in design processes advised by professionals from France that will come to transfer knowledge. Additionally, this center will host a delegation from the Mexican Space Agency, which will complement UTCH's curriculum with further experience and knowledge.
Out of 129 technological universities in Mexico, UTCH was awarded the center. The most important aspect of the project is that the state will now contribute to a system of integrated universities that will increase the supply of highly trained professionals from all over the state. The center already consists of 25 PLM workstations. In August, we will inaugurate the official building and continue installations.

What goals does the university have for the coming five years?
BPP: UTCH is developing a pilot plan with the same career paths but taught completely in English. We have another campus south of the city where the first classroom building is being finished. UTCH needs to take advantage of the 30 hectares of 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 masters programs, and eventually we hope to establish a doctoral program.
FRR: After conducting a situational analysis, UTCH plans to expand in two aspects: the first being manufacturing and the other in maintenance. In manufacturing we have more short term goals. We are really excited to participate in the aerospace industry on an international level. •


CDR


AS


RC

Chaquer Dajlala Ricarte, Alberto Salomon & Ramiro Cedillo

CDR: Director General of INADET
AS: Director of Cenaltec
RC: Professor
CENALTEC

Can you give a brief introduction to Cenaltec and how the institution has evolved since its establishment?
AS: Cenaltec Chihuahua started operations in 2006. We have been growing and incorporating new areas of expertise into our training programs. We are not exclusive to the aerospace sector, but 4,200 of our students are working towards, or are already in, that field. Cenaltec's course content is driven by the private sector.
In 2006, Honeywell aerospace moved a facility to Chihuahua as everything was properly developed here, with one main exception: people. Chihuahua has a technology park, impressive services, the welcoming from government and community etc., but there was a deficit of skill for computer numerical control (CNC) machining, sheet metal assembly, and structural assembly. Beechcraft, Cessna, and Bell Helicopter were also developing in Chihuahua, making the demand for skilled labor incredibly steep. An institution needed to be developed so that thousands of people could be trained in the shortest amount of time possible, because all of these companies were eager to commence operations. Courses have now evolved to include specializations such as electrical harnesses for helicopters, lean manufacturing and quality assurance.

What skills are in the highest demand presently?
AS: The multitude of people who were trained in all of the above aspects were needed at the time, but Chihuahua does not see the addition of a new company every month; therefore, there is no great demand for sheet metal assembly anymore. To some extent, this can be seen in regards to machining. If we do not attract more companies to Chihuahua, labor demands will be stable. However, new developments are appearing on the horizon; composites being the prime example. So far in Chihuahua, Fokker Aerostructures, NORDAM Aerospace, Zodiac Aerospace, and EZ Air Interiors are working with composites, which is why Cenaltec is considering moving towards those types of courses. This would commence by conducting training at facilities that are currently involved in composites, and partnering with those who have a specific need for composite development skills to secure the proper equipment.
CDR: Cenaltec's specialized trainers and adaptable services work as a point of attraction for companies looking to invest in Chihuahua's aerospace industry. We work closely with the government to ensure that all those who relocate here are fulfilled in their human-resource needs.
AS: When Fokker Aerostructures came to Chihuahua, Cenaltec was already trained in the tools and processes for sheet metal assembly and structural assembly, but we had only been working with American companies. Fokker brought three of its best technicians from Holland to train staff on the intricacies of their systems and ways of operating. Thus commenced our training-the-trainers program. After training comes recruitment, which then creates a sustainable pool of talent. Today Fokker Aerostructures has about 150 technicians who have gone through Cenaltec.

Since the aerospace industry is growing so rapidly, how is Cenaltec able to keep up with the evolution of technology?
AS: Cenaltec utilizes the latest and greatest technologies from the companies themselves, as we also conduct training on-site, which saves on overall costs and ensures companies' continuous improvement. Cenaltec has been working on-site with Cessna since 2007, in which we train the trainers for their two factories in Chihuahua. The same has been done for Hawker Beechcraft and Bell Helicopter.
RC: Cenaltec ensures that its trainers travel around the country and the globe to expose them to the latest technologies. Last month, some of our instructors went to the United States to attend a seminar concerning CNC machining and brought back the idea that using liquid nitrogen on the machines will elongate equipment lifespans. Cenaltec is the only school in the northern region of Mexico to have F5 machinery and an Acumen milling machine. Additionally, we receive new performance training from overseas through our partnerships. For example, through Fokker Aerostructures we know have the knowledge and technology of Jet-Melt.

What new efficiencies coincide with the Jet-Melt process?
RC: One of the main differences lies in that it does not require a pre-preparation in mixing the adhesive components, and it is instantly ready for use. The adhesive is quickly melted for a seamless joining of the parts. This will start to become more present in Chihuahua as composites become more common, but the humidity of the state will remain a challenge. Since the air we breathe is roughly 12% water, companies have had issues with composite bonding in the past, but this can be mitigated with proper investment in temperature control.

How does Cenaltec hope to grow in the coming five years?
RC: Our work is closely related to what our customers require, but from time to time we like to preemptively act in the direction we hope Ceneltec will go. For example, last year we bought an electrical discharge machine that has six-axis of movement. Even though no one has asked for it, we want to be competitively prepared for the needs of the industry. •

Dr. Héctor García Nevárez

Director
UNIVERSIDAD POLITÉCNICA DE CHIHUAHUA (UPCH)

technologies, and administration management of small- and medium-sized businesses. Our students spend three and a 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 Cessna, focusing on composite materials. Companies specifically ask for UPCh students because we mold quality technicians through 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 68 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/specialized 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, Honeywell was in need of computer numerical control (CNC) operators, metrology and machining processes specialists. UPCh now has courses that directly teach those skills. Our students also participated in one of NASA's design competitions, winning an award for creative engineering design.
The vehicle electrical and electronic systems lab bench tests for aeronautical communications, as well houses the equipment necessary for power testing, channel change, modulation, consumption, alarm flags, parts location, readjustments, etc. The CNC laboratory has a capacity for 30 students and is equipped with various CNC machines, as well as computer-assisted manufacturing (CAM) software for G-Code and M-Code machine programming, where the students practice on control panels identical to those on CNC machines. Students can apply their technical knowledge in our manufacturing lab, using machines such as lathes and milling machines in manual or CNC configurations. Drills and welding machines are also used in this lab, among other machines and tools. Academics and students to carry out their projects can use this equipment.
UPCh's materials lab contributes to the development and skills related to properties analysis and materials resistance, in accordance to courses such as: elasticity, resistance of materials, matrix analysis of structures, manufacturing processes, science of materials, mechanics of solids, machine elements design, vibrations, thermal machines design and CAM.
The automation lab is to develop capabilities and skills related to industrial automation, hydraulic and pneumatic movement control, guided by courses such as: mechanics of fluids, internal combustion engines, hydraulic and pneumatic systems, thermal machines design, electronic programmable devices, braking systems, steering and suspension and automation.
Metrology is aimed to increase knowledge and skills related to dimensional measurements in accordance with classical physics, static, metrology and computer-aided drawing.
Our design lab is specialized in computer-assisted design, computer-assisted engineering, CAM, reverse engineering and quick prototyping with help of a 3D printer, a plotter and the latest versions of software such as NX, CATIA, ANSYS and Solid Works are used. In UPCh's navigation lab, students can simulate real flights with prototype aircraft using specialized software, which is FAA- and DGAC-approved. We can also test flight electronic devices for instrument flight.

In what realms does UPCh hope to advance over the next five years?
We now have six graduated classes from our aeronautical program, and hope to incorporate our alumni in best crafting future classes. In the medium term, graduate level and PhD offerings will be added to our university capabilities. Due to CONACYT, many of our students are presently going abroad to achieve higher-level, aerospace-related degrees, giving them an international perspective on the global industrial trends. UPCh is still a young university, but we have great character and big aspirations. •

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 the mission to form professionals with higher social and technical competitiveness, where our academic programs and our educational model is based on teaching skills and being relevant to the national and international productive sectors. Our institution is continually recognized for the quality of our educational programs, research, specialized services, and the leadership of our graduates who help sustain the aerospace industry. Currently, UPCh is on the course of accrediting its programs in engineering with the purpose of improving the quality of the educational process. UPCh has four educational programs: aeronautical engineering, automobile mechanics, environmental

Martin F. Flores

Director
COLEGIO DEL AERONÁUTICO CAAMEX (CAAMEX)

structural reparation, sheet metal, structural analysis, non-destructive tests, metrology, machining, maintenance, aircraft power plant overhaul, applied aerodynamics, hydraulic, pneumatic, and electric systems.
On average around 200 students graduate per year from our certification programs and workshops. Between 60 and 80 graduates are engineers who work in design and production, while 50 to 60 are educators. The remaining numbers are college students who seek to become specialized in something particular to a job in the aerospace industry.

Where does CAAMEX source its aerospace engineering professors? And what kinds of industry related machines do students have access to on campus?
Our multinational instructors currently work in maintenance, reparation, and inspection of aircrafts in several manufacturing plants in the area. Students have the privilege of working with tangible materials, actual fuselages, and with real power plants rather than being limited to a workbench with sample parts. Our flight simulation room emulates a working aircraft with its diverse systems, 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.

Are there any internships or co-op partnerships that CAAMEX offers students, or are there special relationships with the private sector?
CAAMEX has active agreements that link it 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. Constant collaboration with said institutes, and the Chihuahua Aerospace Cluster, ensures that there is always an influx of prepared personnel in all needed areas.

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, which raised a need for high-paced training. In regards to technical 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 being said, Chihuahua still has room to grow regarding the level of education.
One practice that we focus on is making sure those who graduate from current aerospace programs are prepared to immediately enter the aerospace workforce following graduation. This is why theoretical and technical education systems work dually; this industry requires hands-on knowledge.

With aerospace as a rapidly expanding industry in Chihuahua, do you predict an uptake 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 programs to adhere to these needs. Technical certificates, bachelor's degrees, and engineering 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 topics are added to our technical programs. In 2016, CAAMEX will have access to curriculums accredited by the International Civil Aviation Organization (ICAO), which will add more value to the training programs offered to aerospace businesses.
Please provide a final message for GBR's readers, the international aerospace community.
In the same way that one place can have certain characteristics that are impossible to imitate somewhere else, the manufacturing, reparation, and overhaul of an aircraft is only possible in certain places where the sum of competence, abilities, and circumstances come together to bring forth growth. Chihuahua has that specific combination of factors that allows for success 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, Chihuahua is named the aerospace center of Mexico. We invite you to visit the region where the word 'impossible' does not exist concerning aerospace projects. •

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 small aircrafts. Responding to the increasing demand from the aerospace industry, CAAMEX started to provide training, consulting, and design of educational manuals to those working on the technical and university level. Over time, training was offered to engineering students from a number of universities with hopes of enriching their professional potential.

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,

Image: FRISA

NUEVO LEÓN: MONTERREY'S INDUSTRIAL EXCELLENCE APPLIED TO AIRCRAFTS

"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

Image: Maquinados Industriales Mitras, S.A. de C.V. (Mimsa)

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 industry it was only a matter of time before international players from the aerospace industry began to look to Monterrey in their efforts to develop the Mexican supply chain. Companies such as GE and Honeywell established sourcing offices in the region with the aim of developing Mexican companies to become aerospace suppliers. The model of Monterrey's aerospace sector today differs from that of Tijuana in that it is composed nearly entirely of tier one and tier two suppliers with core competencies in Monterrey's aforementioned traditional industries. Pauline Medori, president of the Monterrey Aerocluster said: "In contrast to the other aerospace clusters in Mexico, the aerospace industry in Nuevo Leon started with tier one and two suppliers. Mexican companies, like Frisa Aerospace, started to develop components for the aerospace industry."

The Monterrey aerospace cluster was established in 2009 to support 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-

triales Mitras (Mimsa), a smaller family owned company offering machining services, said: "Our experience in other industries such as oil and gas and power generation has meant that in terms of machining our transition into aerospace has been straightforward. 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 supply 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 TUV whereby local suppliers wanting to expand into aerospace pay only 30% of the cost of an audit. Despite this support, accessing finances remains a challenge for smaller companies. With regards to developing the supply chain, the focus from the government and the cluster is 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 within the aerospace sector which will lead to significant growth," said Secretary Turner.

It is important for the government to really understand the nature and 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.

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 implemental in improving emerging industries so as to support Mexico's competitiveness. Human resources are one of the most important requirements of the industry and Tec de Monterrey is positioning itself to be the partner of choice. Unlike UNAQ in Querétaro, which is entirely, aerospace oriented, Tec de Monterrey does not have specific aerospace degrees. Instead, the university aims to develop transferable skills that can be applied in the aerospace industry. "The approach that we have had for a long time is to offer the pure basics, such as industrial engineering, mechanical engineering and mechatronic engineering," said Dr. Manuel Zertuche, dean of science and engineering.

Zertuche believes that this gives the students more freedom to move within the industry. The Monterrey Aerocluster plays an important role in ensuring that Universities in the region are kept informed of current industry requirements so as to tailor their curricula accordingly.

While graduates may not be in short supply, one issue that the Aerocluster has identified is the lack of skilled labor. Universities like Tec de Monterrey have identified this issue and offer technical programs on a company need base, but there are still no continuous 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 site director for Noranco, this is the most valuable aspect of the Aerocluster. "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 aeronautic engineering program and began to look at the idea of having an aerospace-dedicated research center that would develop highly specialized human capital. The Center for Research and Innovation in Aerospace (CIIIA) was founded in 2012. "CIIIA offers bachelor's degrees, where we train aeronautical engineers with a strong tendency towards design, structural design and materials like nickel and titanium based super alloys and composite materials" said Dr. Patricia Zambrano, general director of the center.

CIIIA's focus on design is important for Monterrey's role in Mexico's aerospace. According to SEDEC, though the Monterrey cluster 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 have been able to benefit hugely form the wealth of talent," said Octavio Rangel, general manger 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. •

Fernando Turner Davila

Secretary for Economic Development for Nuevo Leon
SEDEC

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 contributed to the very high level of education in Monterrey. The region supplies a significant amount of human capital with excellent engineering and technical capabilities to the aerospace industry.

In Mexico in general, foreign companies own most of the aerospace industry, whereas most of the aerospace companies located in Monterrey are not only locally owned, but also significantly growing on their own without foreign investment. The aerospace industry is a strategic sector for the government of Nuevo Leon and we have been focusing substantially on attracting aerospace companies to the state. We currently have 28 MROs that are certified by the DGAC and 4 of them certified by FAA.

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

SMEs in Mexico face a huge challenge in terms of access to credit, which results in very few Mexican owned companies entering the aerospace industry. Entering the aerospace industry is a long term investment which means that return on the investment will take a significant amount of time which SMEs cannot afford.

As an economic development agency, SEDEC tries to help SMEs to enter the aerospace market, but the incentives and support that we can offer are not enough to put these companies in a position to compete with bigger companies. For SMEs to be competitive in the aerospace sector, they need access to long-term loans at more flexible rates. SEDEC provides aeroclusters with funds so as to neutralize some of their costs.

In terms of foreign investment, what are the strategies and processes through which SEDEC is promoting Nuevo Leon's aerospace industry?

SEDEC has been working closely with local suppliers so as to promote their services abroad. We work with the office of procurement to help us find suppliers that are open to joint ventures and partnerships. Companies moving their operations to Mexico are often looking to reduce their costs in terms of labor as well as attaching their operations to the local supply chain. This results in many international companies entering 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.

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 apply the joint venture or partnership model to several companies in Monterrey. The focus is to diversify existing companies into supplying to the demands of the aerospace industry.

There is a pending issue 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 operating in Mexico to certify their products within the country without having to go the US.

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

The challenge is still to convince OEMs that Monterrey has very strong capabilities within the aerospace sector. The Monterrey Aerocluster can help to diversify existing companies into the sector and to certify local companies. •

Pauline Medori

Managing Director
MONTERREY AEROCLUSTER

Can you give a brief history of the Monterrey Aerocluster and what inspired you to establish the cluster?
In contrast to the other aerospace clusters in Mexico, the aerospace industry in Nuevo Leon started with tier-one and tier-two suppliers. Mexican companies like Frisa Aerospace started to develop components for the aerospace industry. About 10 years ago, it also happened that companies like Honeywell and GE Aviation started to look for suppliers in Mexico and this resulted in a supply-chain-development program.
Nuevo Leon has a very strong and developed industry compared to other regions, especially in metal mechanics, and we also have an alliance with CAINTRA, which is the regional chamber for industrial transformation composed of 3,000 members. There was great opportunity for growth in the Monterrey aerospace industry and the first companies operating in the industry were the suppliers. At that time, original equipment manufacturers (OEMs) did not yet operate in the industry and design was not yet incorporated. Over time, more supplier companies became certified and entered the aerospace industry. Monterrey has a group composed of one OEM, about 26 tier-one and tier-two suppliers, most of which are small and medium-sized enterprises that do metal mechanic works while also operating on Mexican capital.
Most of the manufacturing companies in Nuevo Leon are operating in different sectors like the automotive sector, electrical sector, mining sector, home appliances sector and the aerospace sector. For all of these companies, the aerospace sector plays a very important part in their operations. The exception to working in different sectors is 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 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 market. We have noticed that although the the biggest OEMs and tier one companies based in Mexico states that they want to develop rapidly the local supply chain; it is a long process to develop a supplier-base in Mexico. 98% of our sales in the aerospace industry of the region are exported with 50% 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 database. 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 contract consulting experts to do assessments of what is needed in a company from 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. The sectors are MRO for private aviation, machining, forged rings, and assembly. We want to be recognized and to have good suppliers in these four main pillars of the sector. Currently we are busy redesigning our strategy for the coming 10 years. •

Eduardo Garza T. Junco

CEO
FRISA

Can you introduce us to Frisa with a brief background on the company and a history of its involvement in the aerospace industry?

Frisa is a fully Mexican-owned company that is involved in heavy capital goods components for industries such as oil and gas, and power generation. In early part of the twenty-first century, there was an increased interest from aerospace prime contractors in developing suppliers in Mexico. GE and Honeywell are two companies that established sourcing offices in Monterrey, a city with a strong history in the manufacturing industry. Their goal was to develop existing Mexican companies into aerospace suppliers. Frisa was one of the first Mexican companies to pursue this strategy of diversification. Our expansion in the aerospace sector began as a joint venture with a U.S.-based company that was able to provide us both with the necessary capital but more importantly the expertise on how to operate in this industry. After three years of activity in aerospace, Frisa bought the 50% share from its U.S. partner and now operates as an international supplier to major prime contractors around the world.

How important was the expansion into aerospace for your continued growth and is this a strategic decision more 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 in Mexico is that a history in the automotive industry provides a good gateway into aerospace, but this is not the case. It is easier to transition from industries that are more technical and where the focus is more on the product than on productivity. In any case, the barrier to entry for the aerospace industry will always be high. It requires a long-term strategy in order to establish the trust that is so essential to being 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 and their application is almost entirely in engines so our customers are the engine original equipment manufacturers (OEMs) such as G.E, Pratt and Whitney, Rolls-Royce, and SNECMA. These rolled rings are a critical component in a jet engine and require very high specification materials as well as strict processes and controls. We are predominantly involved in the new programs, as breaking into legacy programs is challenging. Our products are used in platforms such as Trent, LEAP, GTF and the GEnx engines. Frisa is now acknowledged as a world-class player in the aerospace industry and has been recognized by several major aerospace customers as supplier of the year based on its high level of delivery, quality, and cost performance.

Has Frisa made any effort to externalize any secondary processes needed for the fabrication of its products?
The reason that we carry out most secondary processes in-house is due to the size of our products. In general Mexican companies do not have the equipment or facilities to accommodate these components. For destructive testing, however, we managed to convince one of our suppliers from California to establish a lab in Monterrey. We were able to offer Exova (originally Bodycote) a 10-year contract to incentivize them to set up operations here. It is important for companies in Mexico that want to attract suppliers to the country to be able to offer a well laid out, long-term business plan in order for the investment to be worthwhile.

With regards to attracting foreign suppliers what profile of company should the government be targeting?
There are many labor-intensive processes required in the aerospace industry and certainly some regions in Mexico are well suited to that. However, in Monterrey, where the cost of labor is higher than the rest of the country, we can provide more value-added labor at a more technical level. OEMs should look at Mexico, in particular Nuevo Leon, as being able to offer this higher level of labor and be confident in transferring more critical processes to the region.

Mexico still has a stigma of being simply a destination for cost-competitive manufacturing, but in Nuevo Leon the real differentiator is the mid-tier human capital. There is a far greater abundance of engineers in Mexico than in the United States or Canada. It is important for the international aerospace community to understand that the skill of Mexican engineers is the same as north of the border or in Europe.

Do you have a final message?
The aerospace industry is a challenging, but important step for Mexico as it brings value for all other industries and is hugely strategic from a diversification perspective. The talent is readily available and willing to serve this sector, and Mexico can be a vital solution for international players. What is critical now is to be able to establish a platform on which local small and medium-sized enterprises can communicate with prime contractors and demonstrate their potential. •

Benito Gritzewsky

Director General
HEMAQ

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 upgraded the company to a high-tech distributor with only world-class computer numerical control (CNC) machines with high-precision capabilities. Our unique advantage over the rest of the market was that HEMAQ was able to offer local technical and engineering support, plus showrooms with live machines for our customers. This has made a substantial difference in the country. A big step for HEMAQ in 1994, was the implementation of our program named HEMAQ Atencion Plus, offering full 24/7/365 support for emergency purposes. This program was upgraded in May 2010 to HEMAQ Atencion Plus Garantizada, a guarantee to our customers that should they require any technical support, our teams would reach them on site within 24 hours or the service would be free of charge. HEMAQ is able to perform projects from the very simple to the most complex turnkey projects. Today HEMAQ's customers are able to benefit from its high-quality engineering capabilities without having to look outside Mexico, making local solutions more convenient and economical.

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 mechanic 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 upgraded 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 where the main challenges in diversifying into the aerospace industry?
HEMAQ ensures that its staff is flexible and highly competent in all sectors and as such does not have a team only dedicated to aerospace. The country's rich history in metal mechanic processes gave us the 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 can 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 top three aerospace forging companies in the world. There are huge facilities in the States of Sonora, Querétaro, 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 Querétaro, 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 funding to diversify their operations?
It is nothing new that in Mexico we have a tremendous challenge related with financing. Unfortunately for more than 30 years, financing for the industry in general 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 commitment are key, and too often SMEs switch to an easier, more accessible industry as this offers a faster return on investment. What we are seeing more, though, is prime contractors attracting their own suppliers to Mexico.

Do you have a final message?
I would reiterate that competitiveness, performance, commitment, productivity, and reliability are the keys to today's manufacturing. Mexico has proven that it can be a destination where investments see all of them together. The Mexican aerospace industry is growing, and we gladly invite global companies to grow together with us, to expand in Mexico by taking advantage of the growth of the local aerospace industrial market. •

Aldo G. Rodríguez

Site Director
NORANCO, MONTERREY DIVISION

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 been involved in the aerospace industry for nearly two decades and is oriented to metal mechanic 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 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 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.

What are the key services this facility is able to offer the aerospace industry?
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. This plant is the most vertically integrated of all Noranco's facilities with nearly all secondary processes carried out in-house. The corporation has the structural maturity and experience for this site to be fully vertically integrated without distracting from our core competency of fabrication and machining.

How important is your membership to the Monterey Aerocluster and what role is this platform playing for Noranco?
Noranco only recently became a member of the Monterrey Aerocluster but our membership is a crucial tool for important, pre-competitive collaboration between local aerospace companies. The key benefit is shared training resources. Training can be costly and challenging should it be carried out by individual companies and made specific to their needs. As a cluster we can pool knowledge and work towards establishing communal training programs. Another benefit is being able to put forward a unified voice to the government and academic institutions. This allows the industry to have far more influence and better chances at succeeding in implementing potentially beneficial changes.

What profile of prime contractor should the government be looking to attract to Monterrey?
The profile of prime contractor that would benefit most from what Monterrey has to offer is one that is involved in the integration of more sophisticated equipment such as electronics, flight controls, or even retrofit of interiors. There is a wealth of opportunity in the retrofit of aircraft. Even the newer fleets are constantly being reconfigured and updated and Mexico, in particular Monterrey, could play a leading role. Monterrey's industry is young and still adapting, but growing exponentially. The arrival of large international players involved in the retrofit or reconfiguration of aircraft could be a catalyst for a boom similar to the one that Querétaro has seen.

Over the next five years what challenges do you foresee in your ramp up and what is your strategy to overcome them?
The challenge for Noranco will be in keeping up with the addition of more work while maintaining good control. There is no shortage of business for us, but we will have to ensure that we have human resources available in both quantity and quality to take it on. My main focus therefore will be on training and specific skill development for our existing personnel. Our goals will be to develop those that are efficient and oriented towards to the future needs of our customers. Another challenge for us will be keeping pace with global advances in technology and stay ahead of the curve in terms of new manufacturing processes.

Do you have a final message?
Today Mexico is achieving things within the aerospace industry that would have been unthinkable 20 years ago. The country has a huge amount of advantages to offer the international aerospace community particularly with regards to available talent and it is important that the world be made aware of this. Mexico is now number five in the world for aerospace exports. This rank could easily rise, but the country must now focus more on being more sophisticated and more involved with higher-value processes such as systems integration and design. •

Patricio Murga

Director of Technology & Development
VIAKABLE

Can you give a brief background of Viakon and the development of Viakable?
Viakon is a product brand name of Viakable, and the company will celebrate its 60th anniversary in 2016. Viakable is part of the Xignux Group which is a consortium consisting of four divisions: cables, transformers, infrastructure, and food. Our manufacturing plant in Monterrey is also the mother plant of Xignux.
Viakable started very small with only the manufacturing of conventional-wiring systems, and we have grown significantly over the years. Until 1985, we had a strategic partnership with Canada Wire & Cable. We are present in most of the product families in the group with the aerospace product family being the latest addition. Even though we are still a small player in the aerospace industry, our strategic mission is to grow and become one of the major players.

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 obtain 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 we 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.

There is significant potential in Monterrey in terms of academia. Is the sourcing of human capital for Viakable 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.

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 obtain additional capacity. One way to grow quickly is to acquire a company operating within the aerospace industry.

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 aerospace 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 international aerospace community?
Investors should join the industry, but also be patient. If one wants to have an active role in the aerospace industry, one has to already have a sustained business. •

Fernando J. Turner

Executive Vice President, Strategic Planning
KATCON

Can you provide a brief introduction and history of Katcon?
Katcon started operating in 1993 as a manufacturer of catalytic converters. The reason for establishing Katcon was that Delphi, who was then still part of General Motors, had a demand for catalytic converters. Our parent company was already supplying aluminum parts for General Motors, and thus Katcon went into a partnership with Delphi as to supply them with converters in Mexico.
Katcon started as a very small company with only four operators and two young engineers. For the first eight years, the company grew quickly, expanded its operations, and moved into a new facility. Katcon also started to export its products to Colombia and Brazil and by 2005 it reached the goal of shipping five million catalytic converters from its plant in Mexico. In 2007, we acquired the Delphi manufacturing plant in North America as to further expand our operations and in 2009 we also acquired Delphi's exhaust business. After the acquisitions, Katcon had a presence in every continent in the world.
Today we have completely bought out Delphi and have technical centers with designers in the United States, Luxemburg, Shanghai, and Monterrey. The company has sales revenue of $400 million and has grown from servicing one country to 11 countries. Katcon has the capabilities to design, engineer and validate products for entire exhaust systems. In 2014, we made the decision to participate in lightweight materials and have designing and manufacturing capabilities mainly in composite plastics.
Katcon aims to make structural composite parts for vehicles and nonstructural composite parts for aircraft. We are currently focusing on nonstructural composites for the aerospace industry, as obtaining certification for structural parts will take a significant amount of time. Katcon has HP-RTM equipment, which will be the main technology that we use for manufacturing lightweight products. With regards to the aerospace industry, Katcon can add value to composites components within the interior of aircrafts.

The transition from the automotive industry to aerospace can be quite complex. How important is it to have guidance when diversifying into the aerospace sector?
We have found that being an automotive supplier helps substantially with being a supplier in other industries. With regards to the interiors of aircrafts, we have experience from the recreational vehicle and car industry. In the aerospace sector, one has to comply with additional safety requirements, but the technologies are readily available.
Katcon is very open-minded. Currently, it is very beneficial to get technical advice from companies that are specialized in composites. We are open to joint ventures, but we are also content with the advice that we are getting from players within the aerospace industry.

What are the general materials that Katcon uses for the aerospace industry and how do these materials differ from the automotive industry?
A kilogram of mass makes no difference in the automotive industry whereas in the aerospace sector a kilogram of mass is a substantial amount. Companies are willing to pay a hefty amount to reduce the mass of an aircraft as over a period of 25 operating years, mass has a substantial effect on fuel efficiency and carbon dioxide emissions. Katcon is aiming to make premium composites for the aerospace industry.
We will mainly use carbon fiber as to manufacture reinforced composite parts. Carbon fiber is very expensive, but the mechanical properties of the material are excellent. We are also open to use any other kind of composites. Katcon does not want to compete with companies operating in the plastic injection molding industry, as it is a mature industry. The injection molding that we do is only done as an accessory to a different composite part. We have also been investigating other types of fiber such as hybrid fibers, glass fibers and natural fibers. The new trend is to not only use expensive premium materials like carbon fiber, but to optimize other materials and properties by combining them with carbon fiber. In this way, one can create a ratio between the lightweight of the part and the costs.

What are the challenges working with composite materials compared to traditional materials?
The cycle times of composites are slow compared to traditional materials. The curing of composite materials can take a significant amount of time. Another challenge is to introduce composite materials to engineers that have been working with steel for a significant amount of years. The engineers have to be convinced to work with new materials.
The infinite combinations of materials and orientation of fibers is almost impossible to model as it will be very expensive and difficult and may not be very reliable. Modeling of combinations is something that is holding the industry back from growing faster. Tools for manufacturing composite components are also very expensive.

What goals does Katcon hope to achieve within the aerospace industry?
Katcon would like to supply six different orders of composite parts to the aerospace industry in the next five years. We want to manufacture products that are lightweight, high-quality, and still cost-competitive. The company wants to build on its existing track record and continue growing in both the automotive and aerospace industries. •

Jaime Perez

Director
JAITER

Please provide a background of Jaiter?
Jaiter was established 35 years ago. It began manufacturing parts for machinery made here in Monterrey. Since 1998, we have been producing aircraft turbine parts for GE Aircraft. They helped us to develop the products and put together our quality control procedures. From there we obtained our AS9000 in 2004 and have maintained it since. We specialize in rings for aircraft turbines. We have made other smaller components for fuselages, but rings remain our specialization. We are currently manufacturing parts for Frisa.

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 machinery, 2 small size machines for more specialized parts, and one large machine for larger and 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.

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 it's 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 have one?
Promotion and training. It is of a big importance to count on an organism that helps to promote the industry overseas.

Is there a need to promote Monterrey's aerospace products to other states and countries?
Currently, this need is covered by the FEMIA and the Monterrey AeroCluster.

You mentioned you are also involved in the design process for other industries. Do you see Jaiter expanding its design capabilities to grow its business in the aerospace industry?
As of now, we have engineers that have the expertise needed to design parts. In the aerospace industry it is difficult to design new parts but we do have people qualified enough to do so. A few clients have asked us to design some improved parts and they have liked the outcomes.

As a final message for our readers, what do you have to say about Mexico, Monterrey and its aerospace industry?
Mexico is a country of big opportunities for the foreign industry, where you can find companies highly qualified on the fabrication of aerospace parts like Jaiter. We are competitive, offer good pricing and count on international quality standards. We know how to do things well. •

Carlos Ramírez

Director
TECNOLOGÍA PROCESOS Y MAQUINADOS, S.A. DE C.V. (TECMAQ)

Can you give a brief introduction and history of Tecmaq and elaborate on any recent milestones?
Tecmaq has been operating for 15 years and we are a company dedicated to do CNC machining. The company focusses 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, power transmission, fluids, transportation and aerospace. Tecmaq 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.

When did Tecmaq identify opportunities in the aerospace sector and how important is this sector to the company's operations?
About 7 years ago Honeywell identified México as a low cost region with a potential supply chain to be develop for the aerospace market. As there were ample opportunities, the state government joined the developing program and several companies were invited to participate in the program.
Eventhough the new market was a challeng ,Tecmaq 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.
Tecmaq 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 certainly be an important project to Tecmaq. 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.

Tecmaq has AS 9100 certification. Are there programs in place in Monterrey to help companies achieve these certifications?
It is not very difficult to attain AS 9100 if you have an ISO certification. The government has substantial incentive programs that help companies to achieve them. With regards to Tecmaq, we participated together with an educational institution to achieve our AS 9100 certification.
In the aerospace industry, customer approvals are also required and every client is different. One of the toughest challenges in the region 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 well as the customer's approval. As these processes are mostly sourced outside of the region, it takes away some of the economic price advantages of machining in a low cost country.
Can you elaborate on the parts and the materials the company works with for the aerospace industry?
Tecmaq defines our strategy in the machining of aluminum structured parts. We decided to focus on this type of parts due to its cost structure having a higher machining content with more cost savings to our clients. We do parts in the range of 20 by 20 inches and below.

What is Tecmaq's strategy for growth in the aerospace industry and what is the typical profile of the customers you will be targeting?
Tecmaq will be targeting tier one and tier two suppliers. We are not looking for opportunities with OEMs in the nearly future. Our goal is to keep the interest in the development of the local aerospace supply chain by continuosly satisfy our current client´s needs.
The other goal is to develop the human resource further in terms of engineering and quality personnel. There are currently substantial efforts from the academic institutions to align academics with the aerospace industry. Although all this efforts to develop the manpower there is still a lot to do.

What is the profile of companies that the government should be targeting to attract to the region?
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. In terms of developing the local companies, programs should be in place to target the requirements of the quality systems of this market . Through the aerospace cluster we need to be able to show the Tier 1, Tier 2 and OEM companies what infrastructure and possibilities the region has to offer. To grow the aerospace industry, we need to become a value added region showing a strong integration between academics and industry.

What are some of the key factors in Tecmaq's growth strategy and what goals would you like to achieve within the next five years?
Tecmaq has the equipment, manpower, quality and skills to machine the aluminum structural components. The most challenging goal is to convince special process suppliers to come to the region and get involved in the local supply base.

Do you have a final message for our international readership?
Aerospace is a tough industry, but the supplier customer relations are very dependable and stable. Diversification is very important and the aerospace industry can offer that. There are a many great opportunities as there is a huge need for a supplier base. •

Blanca Lopez

Administrative Manager
MAQUINADOS INDUSTRIALES MITRAS, S.A. DE C.V. (MIMSA)

Can you provide an introduction to Maquinados Industriales Mitras?
Our company is a family-owned business that began operating under its current name, Maquinados Industriales Mitras, S.A. de C.V. (Mimsa), in 2002. We offer machining services to select companies from a range of industries including oil and gas, steel and automotive. Our involvement in the aerospace industry began three years ago when we were approached by a multinational corporation that designs, manufactures and sells airplanes with a wish to develop our company as one of their suppliers after seeing the quality of components we had been producing for fixtures used by aerospace company SNECMA.

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 the AS9100 certification. We had to make substantial changes to the organization of our business and shift our mentality from a family-owned company to a more corporate one. The first aspect that we addressed was production. We began implementing a new system by which we could measure all aspects of our production line. Following this, according to customer's requirements, we had to put in various security measures to back up all project information.

What challenges did Mimsa encounter in transitioning into aerospace?
Most parts that we are manufacturing for the aerospace industry are small components of relative simplicity and as such are well within our range of capabilities. Our experience in other industries such as oil and gas and power generation has meant that in terms of machining our transition into aerospace has been straightforward. The challenge has been on the administration side. We have had to begin using highly technical and specialized software such as Catia.

To what extent do you have control over your own supply chain?
Mimsa is fully responsible for managing all aspects of its supply chain. We have one raw materials supplier that is pre-approved from which we buy the metals. For second 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. 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 and what are some of the issues you are tackling collectively?
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 Querétaro and does not have technical schools, but it is unrealistic for companies to send their staff out of state for training, as the costs are too high. We are working together to create training programs in Monterrey to better prepare the available talent for the aerospace industry. •

Diego Martinez

Commercial Director
DYNAMIC LOGISTICS

Can you give a brief introduction and history of Dynamic Logistics?
Dynamic Logistics has been in business for 15 years and our core business is providing international transportation services to various industries. We are involved in complex transportation services that require experience and knowledge of the dynamics and particularities that different industries require.
Like most of the freight forwarding companies, Dynamic Logistics is a non-asset business. We offer an integral solution, bringing all of our service platforms to the different customers in different industries. In order to be competitive, the company invests in building our platforms with all the structure that each industry needs. Dynamic Logistics develops working plans for our customers and we try to stay innovative offering tailored solutions for each company and sector.

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 Logistic 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 witch is rarely by our competitors.
Lead times always depend on where the product is going. We have a well-developed air charter service for our customers in order to meet urgent demands. Also our ground services include team driver options for quick and effective deliveries to the U.S. and Canada. It is important to know the industry as well as the customer to be able to form a synergy that allows us to work out the best possible solution for the customer.

Can you elaborate on the software and technology that Dynamic Logistics use 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 a 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 governments are very involved in trying to bring in foreign investments into their states, but for exports location is the most important.
Monterrey it's a great location as it is very close to the US border and has quick access to main ports. It has a a very well developed service industry because of all the industrial activity that has been growing for many years. •


RL


FY

Ramiro Lozano & Fausto Yépiz

RL: CEO, Quality Control Division
FY: Deputy Director General, Metrolab
GRUPO FOREM

Can you provide some background on Grupo Forem and an overview of how the company is divided?
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 condition for high accuracy calibration. Grupo Forem anticipated very early on the arrival of an aerospace boom to Mexico and this laboratory was built with a view to serving this industry. Today we are able to provide a wide range of metrology services to the aerospace sector.
The third company is Metalinspec Laboratories. This materials test laboratory became NADCAP-accredited with the support of ITESM, Tecnológico de Monterrey. From its inception it took three years to gain all necessary accreditation to work in the aerospace industry. Today Metalinspec Laboratories has aerospace customer approvals from GE, Honeywell and MTU.

What is the typical profile of customer that Grupo Forem companies are working with in the aerospace industry?
FY: Our current 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 Querétaro. 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, but we are committed and as a Mexican company we appreciate a competitive landscape.

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 Test & 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 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 Querétaro.

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 Querétaro is that as a result of the aerospace boom there are far more students graduating with aeronautics degrees and fewer that are focused on metrology, calibration and testing.

Do you have a final message?
RL: Our next major milestone will be to begin operating from our testing laboratory in Mexico City, and we would like to increase the number of tests that we have NADCAP-accredited. Though we are focused mainly on growing in Mexico, Grupo Forem has begun a process of exploring the U.S. market. This is with a view to both gaining a foothold in the market, but also to spreading awareness of the available capabilities in Mexico. The international aerospace community needs to give Mexico the opportunity to perform in these higher-value-added services and a chance to prove that it has what is needed. •

Edgar Escalante González

General Manager
ASESORÍA Y EQUIPOS DE INSPECCIÓN, S.A. DE C.V. (AEISA)

Can you introduce Asesoría y Equipos de Inspección with a brief history of the company?
Asesoría y equipos de inspección, S.A. de C.V. (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 Querétaro.

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. Our core business is to sell the machines, consumables, and supplies used in NDT. AEISA also conducts all installation, maintenance and calibration of our products. For the other sectors AEISA has been providing training courses to our customers on NDT processes for many years. We are beginning to extend this offering to our customers in the aerospace industry.

What NDT methods are most commonly used in the aerospace industry?
In the aerospace industry in Mexico the most common methods of NDT are liquid penetrant, x-ray, magnetic particle, eddy current, and ultra sonic. The key differentiator between the aerospace industry and the other sectors we work in is conditions under which the processes must be carried. The aerospace industry demands a much more controlled environment and process as well as tight inspection criteria.

Is NDT generally carried out in-house or will companies seek to outsource this process?
Generally companies that have high-volume NDT requirements will carry out this process in-house. It is one of the most sensitive special processes needed for the aerospace industry and as such requires a great deal of training and certification. We have encountered companies that simply do not have a high enough need of NDT to warrant having internalized equipment and as such will seek third-party inspectors.

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 fielding 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. •


FR


JR

Fernando Ramos & Juan de Dios Rodriguez

FR: General Manager, Aerospace Division
JR: Strategic Business Development Manager
MEXICO AEROSPACE AMERICAS, EXOVA

Can you introduce Exova with a brief overview of the company's history in Mexico?
FR: Exova is an international provider of testing, calibration and advisory services with offices in 32 countries around the world. Exova has two facilities in Mexico, one in Monterrey and another in Toluca, both are part of the company's Americas division, which has its headquarters in Canada. Exova has been in Mexico since 2007 and over the past eight years we have focused on investing in more equipment, more personal, and newer technologies. We have quadrupled in size.
JR: This facility in Monterrey began as an aerospace laboratory service center for Frisa, and we are now expanding to serve more aerospace companies.

What was behind the decision for Exova to expand to Mexico?
FR: The expansion was undertaken in order 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 Mexico. 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 inspection 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 able to provide 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 on the back of local talent is proof that this country is ready to undertake more technical, higher-value-added processes. •

Dr. Manuel Zertuche

Dean of Science, Technology and Engineering
TECNOLÓGICO DE MONTERREY

Tecnológico de Monterrey is one of the largest and most established universities in Mexico. How are the industry needs incorporated into the syllabus?
The university aims to help improve emerging industries as to support the competitiveness of the country. We work closely with industry initiatives as to incorporate their needs and requirements into the syllabus. The university's school of engineering has been supporting initiatives in emerging sectors such as aerospace, biotechnology and nanotechnology. The leverage that we can provide is training in the specific needs of the industry and research-based innovations.
The importance of the aerospace industry within the university grew as the industry can give Mexico a competitive advantage. As the industry evolves, more design needs are appearing, and there is greater need for specific materials and greater demand for specific intelligence systems. Our mission is to best support the high-value requirements of the industry. Human resources are one of the most important requirements and in this area the university can be a partner to the industry.

What courses does Tecnológico de Monterrey offer that are specifically designed for the aerospace industry?
The approach that we have had for a long time is to offer the pure basics such as industrial engineering, mechanical engineering and mechatronic engineering. Tecnológico de Monterrey does not have a particular special degree for the aerospace industry. Where the university has given more depth to its human resources training is in the areas of research dissertations and internships at companies in the industry. The aim is to develop transferrable skills as to give the students more freedom within the industry. Companies will then add on if there are more particular skills and knowledge required within their businesses.

To what extent does the industry try to influence the curriculum and how does the university keep up to date with current industry needs?
It has been an instrumental initiative to partner with the various industry clusters. The cluster initiates collaboration between the industry, government, and academic institutions. Within the cluster, particular industry needs are identified. The cluster has been an instrumental link as to understand the industry needs, requirements and expectations.

How important is internationalization for the training of students?
Internationalization is a very important aspect with regards to training. We are the strongest university In terms of students that graduate with international experience. The amount of students who graduate with international experience is currently at 55%, and the aim is to have 75% by the end of 2017, and 100% by 2020. Internationalization gives our students the values of global vision and understanding of global markets and trends.

Can you elaborate on the university's real-time projects directed particularly at the aerospace industry?
There is major excitement within the area of intelligent-systems projects. With these, we try to incorporate sensors to different platforms and get intelligent responses from robotics. Making a contribution to the aerospace industry in terms of intelligence-response systems was not thought possible three years ago. We are also involved in materials. Through modeling, we can understand how materials will behave in different conditions.
Most of the projects are done within the university facilities. Through the cluster we can propose our ideas and from there we will partner with companies. We will either fund the project ourselves or collaborate with state agencies. The research that is being done is mainly for the current needs of the Mexican aerospace market and at this stage we are not yet exporting our technologies.

With regards to research projects, is there collaboration between the various academic institutions in Mexico or is it a competitive field?
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 values. 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?
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?
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. •

Rogelio Garza & Dr. Patricia del C. Zambrano


RG


PZ

RG: Rector
PZ: General Director, Center for Research and Innovation in Aerospace Engineering (CIIIA)
THE AUTONOMOUS UNIVERSITY OF NUEVO LEÓN (UANL)

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 Aeronautic 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 of the center 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 doctoral degrees 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 like nickel and titanium based super alloys and composite materials. The university also created a master's program in aeronautical engineering in August 2012. It is a full-time program, where students receive scholarships from CONACYT and must reach a certain level of qualifications to be accepted. The master's candidates are specialized in three main areas: flight dynamics, aeronautic structures, and materials. Finally, CIIIA began to offer a Doctoral degree in 2014. We are working to integrate the doctoral program with CONACYT to offer the same scholarships as the Master's degree.

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, mechanic, and metallurgy industries made it easy for us to build connections with the aeronautical industry. We have students that have worked with MD Helicopters, Frisa's aerospace 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.

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 academia participate in 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.

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 reaching out to us 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 are 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.

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 their 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?
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, they cannot believe 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 as an aeronautic 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. •

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Industry Explorations

THE AEROSPACE AFTERMARKET

Monterrey's MROs

Monterrey is one of the busiest cities in Latin America in terms of private aviation and the city is home to the country's only private airport, the Aeropuerto del Norte. The airport is populated with a number of operators and maintenance shops making for a competitive MRO industry. Not to be likened to the Delta, Aero México TechOps operation in Querétaro, these are smaller more boutique maintenance shops for private aircraft many of which also serve as forward operation bases (FBOs).

The integration of the MRO companies into the Monterrey Aerocluster in 2013 was an important move for the cluster and it hopes that the two branches of Monterrey's aerospace sector can collaborate on issues such as shared training resources. "The two facets share technical resources and that seems to be working. They have the same needs and demands and work on similar projects, but they have different points to where they are working to," said the cluster's managing director Pauline Medori.

As with manufacturing, MROs want to eliminate the steep costs associated with internal training. "Training is sometimes a difficulty as often one has only two or three technicians to train but you have to pay the complete training for seven technicians," said 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 US."

Though it mat not be seen as a key driver for the growth of Nuevo León'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. •

Image: Monterrey Jet Center S.A. de C.V.

Roberto Marcos

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

Can you give a brief introduction and history of Monterrey Jet Centre?

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.

FAA certification requires that the company follow a manual that includes all aspects of the business like warehousing, presentation, 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 as 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.

We expect the market to shift towards Embraer type aircrafts and that will be very beneficial for the company. We are a one-stop shop, which differentiates the company in the competitive market.

Is there a collaborative effort between maintenance, repair and overhaul (MRO) comapnies 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 mainly buy used parts for aircrafts. Used parts are not available in Mexico and thus we source our parts from the United States and Europe. There are efforts to localize the supply chain for maintenance facilities, but the number of suppliers that have parts for jets is significantly few. The local supply chain is currently only able to supply to the small and inexpensive needs of the MRO industry.

There is an established and friendly ecosystem around the Del Norte Airport. What are your thoughts on the evolution of the airport and the services that are going to be available?

There is competitiveness between the shops in the airport, as government regulations on aircrafts are currently very challenging especially with regards to imports. As for the challenges, there are currently not many aircraft coming into Mexico, which slows down the market. The amount of shops at the airport is growing, but the demand is not very high, and thus there is a high sense of competitiveness.

Where would you like to see Monterrey Jet Center in five years?

Monterrey Jet Center is a well-known name and with our experience and knowledge we foresee a good future. We expect the market to shift towards Embraer type aircrafts and that will be very beneficial for the company. We are a one-stop shop, which differentiates the company in the competitive market. •

Eduardo Alvarez

Operations Manager
AVIHEL

Can you give a brief introduction to AviHel with a history of the company?
AviHel was established in 1994 as a small aviation company. The company has grown significantly over the years and currently we serve the whole Northern part of Mexico. We started with only one small aircraft and grew significantly in terms of the number and types of aircrafts that we are handling. AviHel has huge expansion plans for 2016.

What is the scope of services and capabilities the company is able to offer to the industry?
AviHel has customers in both the private sector and government and works closely with insurance companies in terms of air claims. The company has the capabilities to do repair works especially for insurance companies. AviHel's expertise is focused on maintenance and annual inspections. We also do overhaul for some components on the Bell Helicopter 206. The expansion plans for 2016 is with regards to components for the Bell Helicopter 412.

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 VXP and RAD's to analyze vibrations on helicopters, on avionics we have some Aeroflex equipment's like IFR 4000 and IFR 6000 some equipment from Barfiel 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 also has two, two-ton 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 avionics. 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 accreditation for phase 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 start to 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-orientated?
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?
AviHel has to increase 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. •

Humberto Lobo

Director General
GRUPO LOMEX

Can you provide some background on the aviation segment of Grupo Lomex?
Within Grupo Lomex we have two companies that are involved in aviation, ASESA and Transpaís Aero. ASESA was founded in 1977 by my father and I took over as CEO in 1999. ASESA is the largest helicopter operator in the country and is divided between operations and maintenance, repair and overhaul (MRO) services. As an MRO, ASESA offers the most variety of maintenance capabilities with regards to models of aircraft. As an authorized service facility (ASF) for Pratt and Whitney and Bell Helicopter we are able to work on all Bell Models. We are also able to provide services to the AW109, AW139 and AW119 models of Augusta Westland. ASESA offers MRO services out of facilities in Ciudad del Carmen, Mexico City and Monterrey.
Transpaís Aero was established before ASESA in the early 1970s and is focused on fixed-wing aircraft. The company has grown considerably over the past decades and today is an ASF for Cirrus and the Phenom family of Embraer aircraft. Transpaís also has capabilities in Piper and Falcon airplanes for which we are approved by the DGAC. The company operates in Monterrey and Toluca.

How do ASESA and Transpaís Aero maintain a competitive advantage over the other operators and MROs at Monterrey's Aeropuerto del Norte?
ASESA and Transpaís Aero have the youngest fleet at the Aeropuerto del Norte and as an MRO we are ASF for both Cirrus and the Phenom family of Embraer. An important competitive advantage that we have is the proved experience of our maintenance team. All of our staff have at least 15 years working with us on the technical side and have deep knowledge about all the aircraft that we maintain.

What is ASESA and Transpaís' strategy for sourcing their human capital requirements?
Both Transpaís Aero and ASESA send a lot of their personnel to train directly with the manufacturer and well-recognized training centers. Also, we make local training programs. Finding the right staff is not always easy, but we have found that many specialized personnel in Mexico aspire to work for us. This means that we have little trouble with retention. Training is of huge importance for us and a large part of our resources are spent on this. ASESA continues to run a dedicated training program for which we recruit directly from schools. They work for a year and a half with us as an apprentice until they are ready to handle more advanced work.
Mexico produces a lot off engineers, but what is often lacking is human capital on the technical level. However, recently there has been more in the way of technical schools offering this type of formation. Universities such as UANL and government programs like CONALEP are developing schools to meet these specific needs

How important is the development of a local supply chain for the MRO business in Mexico?
Currently ASESA and Transpaís Aero source all their supplies from the United States. ProMéxico and FEMIA are pushing to develop more local suppliers for the aerospace industry. This is something that is important for the MRO business as well as for manufacturing industry. In the future, we will see more integrated processes carried out in Mexico with the use of local suppliers. This can be achieved through a collaborative effort of industry and government organizations.

There is much lower risk in Mexico than other cost-competitive destinations, and we are becoming well versed in the aerospace industry.

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 foreign companies can benefit from our stable 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 León 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. •

Image: Bombardier Mexico

QUERÉTARO: AN EMERGING AEROSPACE POWERHOUSE

"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

INTRODUCING THE AEROSPACE INDUSTRY IN QUERÉTARO

Image: Airbus Helicopters' Site, Querétaro

The State of Querétaro is flush with competitive advantages that are helping to grow its aerospace cluster. Its proximity to Mexico City and major ports serving both Europe and Asia makes it favorable to foreign investors. The state also has solid infrastructure of roads and industrial parks. The modern, well-designed airport is another attractive asset for aerospace companies. The region is also one of the safest in Mexico, which fosters an environment that is conducive for business. Querétaro has a population of 2 million people, but has the potential to attract 45 million from a radius of 350 kilometers. Finally, Querétaro has a rich background in automotive manufacturing, which has laid the framework for the aerospace industry to flourish.

Through promoting these strengths abroad, the Secretariat for Industrial Development of Querétaro has attracted considerable foreign investment to the state that has been crucial in the development of its aerospace sector. This remains a key strategy of the government.

As the strongest emerging aerospace cluster in Mexico, the focus in Querétaro has now turned to developing a local supplier base. Secretary Marco Antonio del Prete Tercero said: "The only challenge that lies ahead for potential companies wanting to break into the global supply chain is a matter of financing."

ProMéxico has pinpointed Querétaro's specializations as being in parts for fuselage, landing gear, cables, harnesses, precision machining and maintenance, repair and overhaul (MRO), which are being attended to by the state's 40-plus companies. Though ITP has been operating MRO services in Querétaro since the 1980s, Querétaro's aerospace industry boom began with the arrival of Bombardier in 2006. This globally recognized original equipment manufacturer (OEM) uses its Querétaro facility to manufacture aero-structures for its family of business jets and for its harnesses and electrical components. Bombardier has been labeled 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. Petsche, PCC Aerostructures, and Aernnova.

Globally, every two seconds there is an aircraft flying with GE engines serviced by Mexican talent.

- Vladimiro de la Mora, President, General Electric Infrastructure Querétaro (GEIQ)

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 Messiers-Bugatti-Dowty, which focus on engines and landing gear respectively. Daniel Parfait, country delegate for SAFRAN Group, also cites the benefits of Querétaro's "strong, skilled labor force." The company is now dedicated to growing its base of suppliers and has developed a tool called the Franco-Mexican strategic counsel, which is directing funds to the development of a local supply chain.

The joint venture between AeroMéxico and Delta Airlines led to the establishment of TechOps, the largest MRO company in Latin America. TechOps moved to Querétaro in 2013, but has identified a gap in the local supply chain in plating services. TechOps is now in the process of reaching out to local suppliers of metals, but first needs to ensure that these companies have the necessary certification.

For local companies wanting to enter the aerospace sector, obtaining certification is a challenge. For a small and medium-sized enterprise (SME) to receive the AS9100 certification, it not only needs funding, but also guidance.

Due to Querétaro's history in the automotive industry, most SMEs are geared towards a low-mix, high-volume business. Expanding to encompass the high-mix, low-volume of the aerospace industry is somewhat unrealistic. RYMSA, a family-owned Mexican company that offers machining services, has its core competency in oil and gas, which faces similar dynamics as aerospace. The challenge facing RYMSA is to find certified secondary processes 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 services.

Meanwhile, companies throughout the supply chain are still sourcing raw materials from overseas as Querétaro has no certified distributors. Alex Slouka, CEO of Omni-X MX, a tooling company that provides bending services, said: "The establishment 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 customers."

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 onboard 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 students researchers and companies."

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

- Marco Antonio del Prete Tercero, Secretary, Secretariat for Industrial Development, State of Querétaro

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 environment in which the state can evolve the role of design in its aerospace sector by training engineers. GEIQ, GE's engineering center in Querétaro, is leading this development 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 GEnx—the next-generation advanced dual rotor, axial flow, high-bypass turbofan 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 aerospace cluster of Querétaro is an efficient networking platform that fosters collaborative efforts to address the needs and directions of the state's aerospace industry. The local government is continuing its strategy of attracting foreign investment, 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 international player not just in manufacturing, but also in innovation and design. •

Marco Antonio del Prete Tercero

Director of Industrial Development
SECRETARIAT OF SUSTAINABLE DEVELOPMENT (SEDESU), STATE OF QUERÉTARO

Can you provide background on the State of Querétaro and how its aerospace cluster has evolved?
The history of Querétaro's industrialization starts in the 1960s with textile, food, and beverage companies establishing a presence here with a view to serving the markets of Mexico City. Over the years the state saw the arrival of companies from metals, mechanics, home appliances, and a range of other industries, but up until the 1990s these were all focused on the internal markets. It was in 1994, when Mexico signed the North American Free Trade Agreement (NAFTA) with the United States and Canada, that the biggest change came about and projects began to be geared towards international markets. It was then that Querétaro became an attractive destination for foreign direct investment (FDI).
Querétaro's aerospace industry began nine years ago when the Mexican government learned that Bombardier was looking for an opportunity to move to a low cost manufacturing location. Following a bidding process, Querétaro was selected as the site of choice and the industry has since grown from there. Today, the state's aerospace sector boasts 80 active members including two major original equipment manufacturers; five maintenance, repair and overhaul (MRO) companies; 12 design and engineering centers; and a range of general service companies that complete the supply chain. Valued at over $1.2 billion and with more than 8,000 workers, Querétaro ranks first in aerospace FDI nationwide.

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 a range of other 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 this sector would not nearly have been as substantial as it has been. A major driver now is education. The state is focusing on the core competencies related to the aerospace sector and also on internationalizing its academic institutes. Through partnerships with France and Canada, our universities are ensuring that students are receiving the correct training and formation in all levels of the aerospace HR chain. It is the development of Querétaro's education system that has nurtured Querétaro's reputation as a national leader in innovation and research and development. The Aeronautic University of Querétaro (UNAQ) has seen more than 5,000 technical graduates since 2006. It is through the alignment of industry, academia, 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. 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 is the most significant goal for Querétaro to guarantee the continued growth of its aerospace industry?
Investment attraction depends on many factors, but what is crucial for us is to become more prolific through our own local companies, a number of which have developed some great opportunities for themselves within the aerospace sector. It is of these success stories that the international aerospace community must become more aware to truly strengthen our local supply chain and reduce imports. The only challenge that lies ahead for potential companies wanting to break into the global supply chain is a matter of financing. Outside of financing, Querétaro has every component needed to nurture the growth of local suppliers that support the aerospace industry. Once this is achieved, Querétaro will very much be seen as one of the most competitive aerospace destinations throughout the world. •

Julien Fabreguette

Director
AIRBUS HELICOPTERS' SITE, QUERÉTARO

What role is the Querétaro facility playing for Airbus Helicopters' global operations?
This plant is dedicated to the production of metallic aerostructures for Airbus Group. Currently, we are a 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 helicopter parts to be integrated in Airbus Helicopters' world assembly lines.

Can you provide more details on how Airbus Helicopters has grown since it established itself in Mexico in 2013?
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 with our customers and with the country.
We started our activities by providing maintenance, support, and training for our customers in the region. Two years ago, seeking more opportunities to further develop our global supply chain, we decided to further extend our footprint in the country by investing in the aeronautical manufacturing industry in Querétaro. We inaugurated our plant in Querétaro in February 2013, and it was an honor to have President Peña Nieto as one of our guests.
Our company has a fleet of 500 helicopters in the region and is currently the only helicopter manufacturer with maintenance and industrial sites in Mexico, where we employ more than 300 people, 140 of which work in Querétaro. Our plan is to increase the production capacity of the Querétaro site in order to pass from the current 120,000 hours of work per year to 800,000 hours per year by 2020. We expect to achieve this by transferring more products from Airbus Helicopters.

Despite being vertically integrated, does Airbus Helicopters intend to adopt a more horizontal business model?
We have recently begun the process of sourcing 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. For that, we also need strong leadership from both federal and state levels to accompany this industrial maturity. Despite starting with an integrated business model, Airbus Helicopters facility in Querétaro plans to change this to a horizontal one, but, in order to achieve this, we will have to get a sustainable network of suppliers in place.

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, there are two scenarios. The first is to have a pre-existing supplier from either Europe or North America migrate to a facility in Mexico to reduce their production costs. In that case, the support on our part will simply be in terms of discussing the volume of 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 come through the Aerospace Cluster, as we can offer advice and intelligence. This applies, for example, in any adjustment of the potential supplier's business model and how to gain the certifications. The government is also supportive in this regard and through organizations such as CONACYT and INADEM, companies are now able to secure the funding needed to break into the aerospace supply chain.

What has been Airbus Helicopters' strategy for the transferal of technology and knowledge?
Airbus Helicopter has a long and tested experience of technology transfer. The concept 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 headquarters in Europe for a training period 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 Querétaro's aerospace industry has a clear model that is being defined by the large corporations like Airbus Helicopters and Bombardier that came here in order to manufacture products at best-cost. The first step is technology and knowledge transfer. After a few years, we embark on the second step, which is to establish an engineering department to support production. After a while, the local facility starts to understand the product better than the mother company, which no longer manufactures it. When that moment arrives, the local facility shifts from workbench to build to print, at which point 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 as it is designing and certifying parts and system for use in aircraft from its Querétaro design center. •

Alfredo Nolasco

Chief Country Representative
BOMBARDIER MEXICO

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 Aerostructures and Engineering Services, Querétaro's site will support the new division business objectives, by enabling the Company to further market its expertise in these fields of the aerospace industry, thus generating new revenues. Bombardier is proud of its 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 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 Aerostructures and Engineering Services Mexico has nearly 1,500 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 CEDIA, 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.

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 strengthen all the components of the national aerospace supply chain.

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 strengthen all the components of the national aerospace supply chain. We think the industry needs to keep working as a team with the authorities and the research institutions in order to keep supporting its long-term development into the future.

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 Aerostructures and Engineering Services business segment, which will enable us to further market our expertise on this field to the aerospace industry, thus generating new revenues. We will also continue collaborating with the authorities, academic institutions, and other companies of the sector, to 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. •

Daniel Parfait

Country Delegate
SAFRAN GROUP

Snecma will be inaugurated in the coming months but is already in operation.
Two other 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 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 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 CFM 56 engine and two landing gears so students might work directly on these products to promote their technical formation. Furthermore, 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, which was put in place by the French and Mexican governments. It permitted the creation of an aero-fund that channels millions of dollars into the development of the local supply chain.

We are seeing the role of design becoming more important within the industry. What role does design play for SAFRAN Mexico?
Mexico is currently moving from its reputation of solely a manufacturing industry to an industry more involved with design and innovation. The country realized that they had achieved a certain level of maturity and that for them to move up in the value chain they had to launch into innovation.
In Chihuahua, one of our subsidiary, Safran Engineering Services, employs about 250 engineers focused on design and innovation. This is a clear representation of SAFRAN's commitment to this important transition.

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 nearly 10,000 orders and Mexico will play a major part of this demand.

Do you have a final message for the international aerospace community?
Mexico for us is 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 development. 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. •

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 cables for Boeing, Airbus, etc.
Today we have more than 4,000 employees and five factories in Chihuahua with Labinal Power Systems. We also have five factories in Querétaro, which started developing mid 2000s. Within the Safran family we have Snecma, which produces motor parts for the CFM56 and will shortly produce LEAP engine parts. We then also have Messier-Bugatti-Dowty (MBD) who produces landing gear. Finally to round out our portfolio in Mexico we have two maintenance, repair, and operations centers, one with MBD that does maintenance on landing brakes and one with Snecma that does maintenance on engines. Anew factory of

José Carlos Garcia

Engineering and Design Director
ITP, QUERÉTARO

At that time the company was called ITR and the main business was focussed on repairs of JDND engines. In 2000, ITR also started with manufacturing and designing 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, ITP 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 tubes and the manufacturing of end fittings for the tubes. The second is an engineering 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 facility, all integrated. 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 new compared to the experience 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 linkage 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 some examples here: our general manager is on the counsel of UNAQ as an industry representative. Also, an important university that established in Querétaro came to ITP to ask for recommendations for its programs and we responded accordingly. ITP has also funded employees in a master's degree with a prestigious university linking 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 tailor their 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 also part of the strategy. ITP continues to look for manufacturing 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, this 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 developing suppliers who can manufacture our products. 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, as new products also evolve, we need to keep up with the tendencies and technological developments for future engines. •

Can you give a brief history and overview of ITP and the company's operations in Mexico?
ITP's story dates back to Spain in 1989, when the company first became involved in a European defence program, the EJ200 engine for the Eurofighter. The company has evolved from this original programme and it currently participates in nineteen separate commercial aviation and defence programmes, having consolidated its market position as one of the top ten aerospace engine and components companies in the world.
Prior to becoming part of ITP, the business in Mexico was established in 1982 and was then a government-owned company. It started as there was a need for aerospace engine repairs in Mexico and the government set up an engine-repair facility. In 1995 the order of the company changed as the government sold some of the shares. In 1996 the government owned company went to bankruptcy and ITP purchased the company in 1997.

Rick Uber

CEO
TECHOPS MEXICO

Can you provide a brief overview of the joint venture between the two airlines that lead to TechOps Mexico being formed?
The CEOs of Grupo Aeromexico and Delta Airlines began conversations about working together more closely, in trying to provide better service and considering that great workmanship in Mexico. With this, the TechOps Mexico project began with the help and vision of Miguel Uribe (TechOps Mexico founding CEO). Originally, the idea was to expand the facilities of the original MRO in Guadalajara, problems were found in the land in Guadalajara. The airports in Mexico City, Toluca, and Tijuana were among those considered, but Querétaro presented itself as the most appealing. Its geographical location, in the center of the country, and government aperture to help with a joint venture were advantages that Querétaro provided.
TechOps moved at the end of 2013, a significant accomplishment, considering 800 people relocated from Guadalajara to Querétaro. TechOps provided housing, free of charge to them, for six months, moving services, transportation between Querétaro, Guadalajara, and Mexico City to visit for six months to visit their families, in the process of relocating. It was the only time an effort this large has been done by the company in Mexico. After the move, TechOps began hiring personnel from Querétaro and strengthened its relationship with the government, which put the company in touch with the Universidad Aeronáutica en Querétaro (UNAQ) to train TechOps's personnel. Making this move required constant work, and our staff has been great, with relevant players, just as our Attorney General Mr. Omar Cuevas.

What key competitive advantages does TechOps offer over other MROs in the region?
TechOps competes against other MROs for the same work and on the same criteria, competing on turn times, cost, and quality. If anything, Delta and Aeromexico hold TechOps to a higher standard than other MROs they have worked with because their name is in the building, and therefore want this MRO operating better than the competition.
All of TechOps's personnel have a license, unlike other MROs. TechOps also has a geographical advantage over competition. Querétaro's weather is good for fuselage, not needing climate conditions in the interior of the facilities. It also well positioned with quick access to U.S. and local suppliers.

What challenges did you face establishing yourself as the largest MRO in Latin America?
Building these facilities was a huge project. Most MROs begin as a small outfit and then grow, but TechOps Mexico was designed to be very big, with corporate offices, hangers, and spaces for workshops, among others. The negotiation for the land was also a challenge. In Mexico, land for a facility with direct contact with an airport implies a complex negotiation. The move also was a challenge, as it was ambitious under little time, but TechOps accomplished it due to its organized approach.

How have you been working with local academic institutions here to support your human resources needs?
TechOps trains its own technicians, since the aeronautical technicians needed are rare. Training occurs through TechOpsU, which then the MRO reviews, making sure they have a great profile for the company's needs. After a year or so, they should have the knowledge base to acquire a license. With the license, they come on as interns and if they pass a final evaluation are hired as technicians with TechOps Mexico. TechOpsU was developed with the UNAQ and Dirección General de Aeronáutica Civil (DGAC). Training its own technicians, TechOps assures it counts with the human resources needed. For example, a class of 120 students will graduate in January, and ideally they will all work at TechOps.

Where are you focusing most to innovate?
Most of TechOps attention must be focused on new technology in the aerospace industry. This airplane, 25 years old, will be operated by Delta another 10 years. As aircrafts are retired, some will just kind of go away, replaced by newer products, such as Boeing 717s or 757s. Focus on new technology can be in flight structures or avionics. The 787 that Aeromexico currently operates is essentially a flying computer. The UNAQ has great facilities, and TechOps hopes to tap into their programs. Training employees how to work on new aircraft requires an outlook that is longer than 10 years.

Do you have a final message about TechOps Mexico?
TechOps Mexico is an ecofriendly facility, using 30% solar energy. The roof is designed to take rainwater, clean it, and use it for the facilities. Beneath them, the facilities have a surface covering to avoid soil damage. The MRO also has a state of the art wash rack, reducing the time of washing an aircraft from three days to 16 hours, saving a significant amount of water. The chemicals used when washing the aircraft are ecofriendly, not damaging the environment. Water is also recycled, potentially used six times when washing an aircraft, and when the water is returned to city sewage, it complies with city standards. Hazardous materials are well treated and processed correctly for disposal. Metals and titanium are taken to company to reuse. TechOps Mexico is a big facility, with a large number of personnel, which cares for the environment, for quality, for security, and for compliance. •

Jorge Gutiérrez de Velasco Rodríguez

President
AERONAUTICAL UNIVERSITY OF QUERÉTARO (UNAQ)

Can you please provide a history of UNAQ and any recent major milestones?
Mexico's commitments with the arrival of Bombardier included firstly setting up a Fast Track Training Program, started in 2006, and secondly creating a new institution formed as part of the long term commitments. The team, along federal and state government, decided to found not only a technical institution but a university. This began analyzing the most representative manufacturing aerospace clusters in the world, like the ones in Wichita, Montreal and Toulouse, looking for a model that could be adapted to the specific circumstances of the country. With this in mind, the idea of a new university began taking shape with the creation of the UNAQ, which provides technical training, associate degree, bachelor's degree, and master's degrees, and eventually PhDs. All training is embedded in one institution, which fulfills the needs and grows together with the industry.
UNAQ was born in November 2007 and opened its first associate's degree in avionics, maintenance, and aeronautic engineering, focused on manufacturing. Bachelor's degrees with competencies for setting up manufacturing processes, aircraft components and maintenance activities launched at the end of 2008, beginning of 2009, responding to the existing needs of the industry at that time. UNAQ continues adding new bachelor's degrees, such as the two newest—one in mechanical, other in tooling and mechanical components design, and another in embedded systems design; all focused in the aeronautical field.

Can you please provide details of the nature of the work UNAQ undergoes with aerospace companies today?
UNAQ fine-tuned a model for attracting and setting up training programs, starting with gathering the needs of companies. When companies look at Mexico and scout whether they may establish in the country, they tend to contact UNAQ and the state government through the Economic Ministry (Secretaría de Desarrollo Sustentable), while deciding whether to manufacture components to fulfill needs of clients in Mexico or of their country of origin. UNAQ works with them to define this, and also helps develop a list of competences for technical training.
Fortunately, companies consider UNAQ more than simply a technical training provider. The university receives several aeronautical related projects, at any point in the process. Here at the UNAQ, we work also on technical issues, such as applied research and technology development for companies. Many companies initially visualize Mexico as a country with basic manufacturing activities, but now with Bombardier´s involvement and engineering services develop, companies are beginning to perceive the country differently.

How does UNAQ tailor its courses to cater to the needs of Mexico's aerospace industry?
UNAQ's college programs work differently. Ideally, the institution counts with a profile of students at the end of the technical degree, developed together with the companies looking to hire UNAQ graduates. The profile typically includes English fluency, understanding blueprints, drawing, competency with certain programs, among others, to fulfill minimum competences the company wants. After that, UNAQ develops a matrix with basic or generic competences, then used to develop the program curriculum, whether for the two- or four-year program, for the associate's or bachelor's, respectively.
The company develops the initial profile, UNAQ provides it, and companies hire a large percentage of graduates, and UNAQ follows up. The follow up includes asking how the graduates perform. If their performance is not up to standard, UNAQ fine tunes its program, developing skills that they underperformed or lacked, for example. In some cases, UNAQ develops and sets up labs, which will help foster skills for other companies as well. For example, nondestructive testing is a process applicable to many industries and with many activities in aerospace. UNAQ enters joint ventures to set up labs and choose equipment, and companies either have time to use the equipment they purchased in the university or there is an exchange of technical training with them. This close relationship is part of the successful activities UNAQ achieves and why its training programs remain pertinent.

What role has the institution played in the evolution and growth of the country's aerospace industry?
UNAQ's faculty, that is to say professors, technicians, and trainers, come from the industry. The faculty's profile in general is more technical or with hands on experiences than having scientific backgrounds. UNAQ keeps its faculty well trained, they already have degrees or certifications in the field, and the university asks companies if they can include UNAQ's faculty in their trainings.
Due to the established close relationships, the institution reproduces company environments as closely as possible, both in manufacturing and maintenance. On a daily basis, UNAQ members use raw materials, consumables, equipment, and documentation, reducing the learning curve of graduates because they are already totally embedded in training environments.
Other aerospace clusters, such as the ones in Wichita, Seattle, and Montreal, reproduce this environment as well, but in separate facilities. In Mexico, we managed to foster a different model, embedding all the different aspects in one single space, Every lab, every aircraft, every investment is focused on being as transversal as possible, with shared resources among students, teachers, researchers and companies. It is a unique model. •

Vladimiro de la Mora

President
GENERAL ELECTRIC INFRASTRUCTURE QUERÉTARO (GEIQ)

Can we begin with a brief overview of GE's aviation history in Mexico and the circumstances that initiated GEIQ?
GE has been present in Mexico since 1896 with manufacturing plants in the north of the country. In 1999, GE's infrastructure business combined aviation, power and water, and looked at the opportunities of globalizing engineering: selected locations were India; Mexico; Poland and China; the rationale being that engineering talent was readily available in these countries. Today, Mexico has one of the highest number of engineers per capita globally, ranging from 80,000 to 100,000. Other reasons for the selected locations were that GE wished to be close to its customers, and favorable operating costs. GE launched its power and water engineering initiatives with steam turbines and steadily gathered expertise on turbo machinery. In 2000, aviation joined GE's power and water service offering in Mexico, majoring on the external part of the aircraft's engine, performance analysis of new/existing aircraft engines, tool designs for assembly of new engines and maintenance of current engines. Today, GEIQ has gathered sufficient expertise to be considered competent in a specific area of aviation. The company's personnel strategy has been to hire from local schools and invest considerable capital in training/assignments in the United States; GEIQ's work performance is continuously appraised by its superiors in the United States. Mexico was the first engineering center outside the United States to sign drawings, a major milestone in the aerospace industry.

How many personnel does GEIQ have in its engineering center and how does it operate with its other global engineering centers?
Today, GEIQ has 1,800 personnel: 1,100 being in the aviation sector; 550 in power and water; the remainder in oil and gas, a new business for GEIQ. GE's engineering centers have specific expertise; however, all centers do interact and cooperate on drawings and analysis of components, i.e. stress and strain.

Are there any case histories that would demonstrate GEIQ's capabilities?
A big part of GEIQ's operations is to support legacy engines and major periodic inspections (MPI). Currently, GEIQ has 100 engineers working on GEnx—the next-generation advanced dual rotor, axial flow, high-bypass turbofan jet engine used in Boeing 787 and 747-8 aircraft. Other work includes MPI on Passport engine for Bombardier, and analysis and component work for CFM International's (a joint venture between GE and Snecma) LEAP, a high-by-pass turbofan aircraft engine.

How has the local supply chain developed to accommodate the aerospace industry?
GEIQ is an engineering center and does not manage supplier relationships, but works directly with GE in the United States. The aerospace supply chain in Mexico is evolving: 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. 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 Querétaro (UNAQ) was established in 2007 to focus on technician 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 Querétaro of the National Center for the Research of Composite Materials have?
Laboratories have been lacking in Querétaro, and the center will be a great addition. Its emphasis on composite materials will complement 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 innovate?
GEIQ's focused areas in aviation are the external part of the engine, external performance analysis, and software development for aviation systems. The aerospace industry will look to complete the value stream and develop the manufacturing process including fast machining, and the machining of specialized alloys and composite materials. For GEIQ, a composite of new materials and 3-D manufacturing will be an important step forward; engines will become lighter and more efficient. •

MAKING THE PRIMES FEEL AT HOME

Building Querétaro's Local Supply Chain

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.

- Esteban Sanchez, Operations Manager, HYRSA Aerospace

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 leading 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 it 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."
Government funding is available in Querétaro to support an SME's process of entry through organizations such as CONACYT and INADEM, but guidance is needed. Julien Fabreguette, director of Airbus Helicopter's site in Querétaro, said: "Support here will come through the Aerospace Cluster as, collectively, we are able to offer advice and intelligence."
Yet even with certification, it can be difficult to attract business without the support of a globally recognized name. Especialistas en Turbopartes (ETU) states that the difference in the culture of work between the United States and Mexico has meant that it is challenging to establish credibility in the aerospace sector. Success stories like ETU are being used by the local government to convince OEMs to permeate more of their business into the local supply chain.
But what about attracting foreign suppliers? As was mentioned earlier, Querétaro certainly offers an attractive business environment to potential foreign investors. It may not be able to offer the proximity to the border that one has in Baja California, Sonora, Chihuahua, and Monterrey, but the state compensates by offering heavy subsidies to large firms and comprehensive training programs out of UNAQ.
A number of foreign suppliers have already been attracted to the business opportunities presented by the OEMs in the state. NDT Expert Mexico, a subsidiary of the European Testia Group, was established to cater to Bombardier's NDT needs. A challenge for foreign suppliers is to guarantee enough business from the aerospace industry in Querétaro to warrant the establishment of a facility, but the centrally located state is also very active in the automotive industry and business can also be found from this sector. "The state is also in the Bajio region and forms part of Mexico's largest automotive industry," said Itziar Larrañaga, general director of Aeroprocess TTT. "This gave us the opportunity to serve both the automotive and aerospace industries."
Ultimately, whether it is through the development of local SMEs or the attraction of international suppliers, the goal of the state is to reduce imports and offer local processes covering all aspects of the value chain. As Querétaro's aerospace sector matures, the large companies will begin to develop more complex, value-added processes. Querétaro has the most potential to become a hub for innovation and design, but for the large firms to be able to incorporate such processes, there must be a solid supply chain to absorb the simpler, but equally important, procedures. •

Jatziri Barrios

Program Manager
ESPECIALISTAS EN TURBOPARTES S.A. DE C.V.

titanium; stainless steel; aluminium; and inconel, with a parts diameter of 4", 36" and 56". All of ETU's manufactured parts are exported to Canada and United States; this includes bearing carriers in titanium for the main landing gear of Boeing 737 aircraft. New customers that we are developing are: Airbus Helicopter, Messier-Buggatti-Dowty, and those in the aero engine sector.

Can you give details of your facility and equipment that support your operation?
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 fulfil 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 has been serious competition between the culture of work in United States and Canada versus Mexico.

Do you have in-house secondary process capabilities?
Within ETUs facility, it has complementary processes for its core business turbo machinery, such as non-destructive testing (MPI & FPI), HVOF, and plasma spray. As the company's aerospace division manufacturing expertise increases, its capabilities in special processes will also grow.

How does ETU ensure quality?
ETU has configuration management; this includes an installed in-process quality system plus risk management. Each time a request for a quote is received, a complete analysis and gap analysis of what is required is 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, achieving an average 85% to 90% qualification.

From where does ETU source its raw materials and how does this affect on-time delivery?
Raw materials come from the United States or via customers under concession. Sourcing outside Querétaro mainly affects price negotiation; the main cost is logistics. Raw material companies are predominantly in North America and deliver to warehouses close to the Mexican border: Tijuana, Monterrey, and Chihuahua. There are currently no warehouses in Querétaro.

How long will be needed to develop a local supply chain?
Small and medium-sized enterprises (SMEs) in Mexico are unfamiliar with medium to long-term planning and seek profitability within a year rather than five. The aerospace industry affords steady growth with medium and long-term contracts; long-term agreements run from three to five years. Companies must be patient for a profit.
Arguably, in the last two years, there has been a favorable change of business demeanor by original equipment manufacturers (OEMs) towards Mexico's SMEs. ETU recently secured Airbus Helicopters and Messier-Buggatti-Dowty as new customers; five years ago, there was no business permeating from OEMs. Currently, some Mexican SMEs do not have certification, capabilities, infrastructure, and supply chain development to the standard of OEM requirements. The Mexican government needs to coerce the OEMs to recognize that Mexico has a viable supply chain, and the SMEs to commit to deliver products on time.

What are ETU's goals for the next five years?
ETU intends to have a new shop constructed close to the OEMs in Querétaro with an integrated division for special processing and manufacturing. Land for the shop has been acquired; the completion date for construction will be 2018. ETU will service the three divisions of the aerospace industry in Mexico: engines in Sonora; aero structures in Chihuahua and Tijuana; and landing gear in Querétaro. In five years, ETU will have an active role in all three markets. •

Rene Trulin

Vice President of Operations
RYMSA S.A. DE C.V.

Could you provide an introduction to the company with a brief history and details of any recent major milestones?
RYMSA was founded in 1989 and has always been dedicated to offering machine services. Having initially catered primarily to the appliances industry, it was in 2000 that we shifted our focus to the oil and gas industry. Today, aerospace and oil and gas are our principle target markets.
In 2006 RYMSA became ISO-certified and started working with number of companies in Houston from the oil and gas sector. At this time 80% of our products were being exported to the United States, Canada, Malaysia and China.
Our move into the aerospace sector came in 2008 with our first customer being Messier Services. We are now able to offer a range of machining services to original equipment manufacturers and tier-one companies from the aerospace industry and in taking care of our whole supply chain we can provide a full turnkey product.

What was behind the decision to expand into the aerospace industry?
With our core business being oil and gas, we have found that this industry tends to be contra-cyclical to the aerospace industry. When one is in a downward flux there will be more in the way of purchasing from the other. In this sense it was a logical decision for us to move into the aerospace sector as it provides a natural safety net to our business.
The requirements regarding safety, quality and delivery times of both the oil and gas and aerospace industries are also very similar. Our work is geared towards low volumes with highly specialized labor.

What is the strategy you are using to grow into the aerospace industry and define the profile of customer you hope to work with?
We recently attended both the Boeing summit in Mexico City and the manufacturing show in San Diego, CA. This gave us the opportunity to establish first contact with potential clients and develop a deep understanding of what their machining requirements were. Our current expertise is in the machining of small- to medium-sized components. Additionally, we identified the need for certifications on all aspects of our own supply chain and so recognized the importance of consolidation on our side with regards to secondary processes such as heat treatment and coating.

What are some challenges and complexities of making that transition from your core industries to the aerospace industry?
Currently 80% of our machines are CNC lathes 20% are vertical, 4-axis machines. In general we have found that the aerospace industry requires more in the way of milling than turning. Our first challenge will be to develop our expertise and capabilities on machines that work on a 5-axis model. The second major challenging is making our supply chain more efficient particularly with regards to sourcing the raw materials. The majority of raw materials found in the local area are for the automotive industry. Currently, we have to source our aerospace materials from the United States, which is increasing delivery times.

What steps to RYMSA take to ensure the quality and on-time delivery of its products?
Regarding on-time delivery, constant communication and transparency through our supply chain is crucial. RYMSA seeks to establish firm partnerships with both our suppliers of raw materials and the companies offering the secondary processes services. Communication with our customers and understanding their needs is equally important. We can thus prepare our partners for what our requirements will be on a particular project, thus significantly reducing delivery time.
Regarding quality, we are committed to the constant training of our team. Our team embraces the industry standards as their own principles, which is reflected in the company's results. Also, we do not skimp on investment in quality equipment.

What is a major goal you hope to achieve over the next five years in the aerospace industry?
In five years we hope to have 50% of our operations dedicated to the aerospace industry. To achieve this we will have to ensure that we maintain pace with advances in technology so as to provide the reliability that is essential for working in the aerospace sector.
We are working to a strategy to offer not only complex machining services, but also engineering capabilities that help us to provide our clients the insights to reduce costs and improve the designs of their components.

Do you have a final message?
Mexico certainly has the HR resources to support the aerospace industry and companies are willing and ready to expand into this sector. We hope that in the future that Mexico will not just be seen as a destination for competitive manufacturing, but will also be a key global player in terms of engineering and design.
In the last few years the Querétaro Government has worked very hard to increase the participation of the Aerospace industry in the region. This has been successful in positioning Querétaro as a key global player in manufacturing. At Rymsa, we will keep investing resources and efforts to be a key part of this success in history. •


ES


JS

Esteban Sánchez & Jerónimo Sánchez

ES: Operations Manager
JS: Executive Director
HYRSA AEROSPACE

Can you provide a brief history of HYRSA and any recent major milestones?
ES: HYRSA was established fifty years ago as a supplier of high-precision parts to the food and automotive sectors. Decades of experience with Computer Numerical Control (CNC) equipment paved the way for HYRSA to enter the booming Mexican aerospace market in 2013. HYRSA Aerospace has grown considerably in the past two years, the AS certificate put us on the map.

What products does HYRSA manufacture for the aerospace industry?
ES: HYRSA Aerospace is the only company of 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 pneumatics.
ES: HYRSA mainly serves the Mexican market by supplying parts to OEMs that they previously had to import. However, we plan on exporting in the near future, particularly to the United States and Canada.

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 an efficient supply chain for special processes?
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 institutes in Querétaro to acquire talent?
ES: HYRSA works extensively with Universidad Aeronáutica en Querétaro (UNAQ) to create internships and job opportunities for students. These programs help us examine worker's aptitudes and skills in order to retain the best talent. With the help of the state government, and in coordination with aerospace companies, these institutes are able to teach practical skills that can be of service to the 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. 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.
JS: Recent private sector investments in Mexico demonstrate this trend. GE operates an advanced engineering center in Mexico that specializes in research and design of airplane turbines and power systems. These investments bode well for the companies and for Mexico as a center of innovation in aerospace.

What advice can you give other small, local enterprises trying to break into the aerospace market?
ES: Aerospace companies have voiced the need for suppliers to enter the market. However, the high barriers to entry make it difficult for local suppliers to acquire the capacitation required. It is important for OEMs and tier-one companies to invest in suppliers 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. Long-term investments from suppliers plus OEMs and Tier 1 long term planning are key for Querétaro´s Aerospace industry to succeed.

What does the aerospace industry represent for you?
ES: At HYRSA, we see aerospace as a life project. It is a difficult industry to penetrate, and we understand that long-term strategies are the keys to success. HYRSA will continue to invest to make sure aerospace players have the suppliers that they need to succeed in Mexico and raise the global profile of the country's aerospace sector. •

Olivier Jay-Rayon

General Manager
TECHFAB INC., MEXICO

Could you provide a brief introduction to TechFab?
TechFab is a privately owned Canadian company based in Québec that was 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.

Having only been in Mexico since February, 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 country's aerospace 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 facility 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 and hope to become a key strategic partner for aerospace companies operating in Mexico.

What do you see as being the most important factor for the continued growth of Mexico's aerospace industry?
Part of our business in Canada was the knowledge aspect of the industry, which is something that we want to bring to Mexico. 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 considerably strengthen Mexico's reputation as a popular destination for the aerospace community.

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 country. 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 Mexican government's vision of reducing imports and having a fully independent supply chain. Mexico can boast an extremely capable skilled labor force. This needs to be 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 comprise over 100 people in five years. We see the potential for this in Mexico, so we are hopeful that our efforts will complete our vision. In terms of technical expertise, we will continue to engage in single-parts manufacturing and build on the applications of our products. The market for our product and service offering in Mexico is large, therefore 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, extremely talented young population. It is a stable environment for our business, and the economy is growing. Finally, Mexico offers 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.

Itziar Larrañaga

General Director
AEROPROCESS TTT

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 processes from vacuum heat treatment to hard chrome and shot peening.

What were the opportunities you identified in Mexico?
When Grupo TTT initially decided to expand overseas we began a process of identifying which market would offer us the most opportunity and would be most in need of our services. Three years ago, our 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 was companies that were able to offer 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 October 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.

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 so 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 will mean that potential 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 will be in use 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 so 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. •


AS


NG

Alexandr M. Slouka & Nora Guerra

AS: CEO
NG: General Manager
OMNI-X MX

Can you provide a brief overview of Omni-X's history and global operations?
AS: We are a family business started by my father, my brother and myself in 1987 in Colorado. We expanded to the Czech Republic in 2000 and started our facility in Querétaro three years ago. We have invested a lot of time and energy into this site, as we see Mexico as a growing market for us in the aerospace and automotive industries. We are a tier-two supplier of bending tools. All of our locations are strategically placed to supply that specific region. Overall about 30% of our business is focused on the aerospace industry and in Mexico this is about 25%, but a figure we are looking to grow.

Why is Querétaro's aerospace sector important for Omni-X?
AS: We offer a very niche service and, as such, do not have a lot of competition in the aerospace industry. We identified the rapid growth that Querétaro was experiencing in its aerospace sector and acted on the opportunity that was presented to us.
NG: We also felt that we could contribute to the growth of the country's aerospace industry by transferring our knowledge from our other global sites. Companies here are very willing to develop their operations in this sector, but many lack the internal structure to do so. We have been interacting with a number of local businesses to aid Querétaro in successfully shifting from the automotive to the aerospace sector.

What are the services and products that you are able to offer to the aerospace industry?
NG: We manufacture bending tools for tubes. We are given specifications of the tube and an idea of what the customer wants in terms of the bend. We then design, engineer and manufacture the tools with which to achieve this. We have strong relationships with the machine makers on which our tools are used to ensure that the customer receives the greatest value product.
AS: There are a great many components that go into an aircraft and a lot of tubing. We are able to work with tubes ranging in sizes from half an inch to four inches and in any metals, though typically in the aerospace industry we work with Inconel and titanium.

What measures does Omni-X have in place to ensure the quality of its products?
AS: We have rigorous quality checks in place, but really what lends us our level of quality is significant experience in this field. The bending sector requires a lot of science, but also a great deal of knowledge from the staff working in it. This is something that Omni-X has built up over the last 28 years.

What are the specific advantages that Querétaro offers to Omni-X as its regional base?
AS: A number of our pre-existing customers are based here, but beyond that, the central location of Querétaro and the security of state makes for a very strong business environment. Because of this, we are seeing a constant flow of new companies to the area and, as such, our business is growing.
NG: The state government's commitment to growing the aerospace industry has also meant that it has been easy for companies like Omni-X to establish itself in Querétaro.

How have you seen Querétaro's supply chain grow in recent years?
AS: Querétaro is home to many great machining shops and a lot of these have been able to transfer their skills to the aerospace industry. What we are seeing is a distinct lack of raw materials, not only in this state but also in the whole of Mexico. 90% of our raw materials are coming from the United States, as is the case for other companies here. This increases overheads and lead times. The establishment of a distribution center for raw materials would allow Omni-X to offer a much more value-added product to our customers.

How have you found the quality of the talent pool in supporting your human resources needs in Mexico?
NG: Unfortunately, the academic centers and training schools in Querétaro have not yet caught up with high-quality demands of the aerospace industry. We have found that the talent coming out of these schools is not up to par with our needs. To address this, Omni-X has used its experience from the Czech republic and the United States to establish its own in-house training.
AS: What we have found, however, is that the general education is good and, most importantly, the Mexican people are incredibly dedicated to self improvement and will always complete a task to the best of their ability.

What are some of the goals that Omni-X hopes to achieve in Mexico over the coming five years?
AS: We hope to be moving next year to a larger facility in order to accommodate our rapid growth. Our goal is to establish ourselves as a leader not only in Mexico, but also in Latin America, by using this facility as a base for those operations. •

IT'S THERE IF YOU KNOW WHERE TO LOOK

Testing and Quality-Control Services in Querétaro

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. Mexico has not yet developed a strong network of testing capabilities and contractors are forced to look outside the country for these services, which greatly increases costs, and lead-times. Nonetheless, more companies, both local and international, are arriving into this field. The country's progression into the field of composites has put more pressure on developing testing capabilities. Additionally, the push for greater integration between academia and industry has contributed to a rise in the number of testing laboratories that are geared towards serving the aerospace industry.

NDT Expert established itself in Querétaro in 2011 to capitalize on the opportunities presented by the gap in non-destructive testing. Though the company has now successfully expanded its customer base in the region, it claims that the principle challenge was convincing its customers to trust an external provider in an emerging market. "It has been difficult for us to convince companies here of the ability of local personnel carrying out these tests," said Nicolas Fournier, Testia International subsidiary manager for Testia Group, NDT Expert's parent company. "We have worked hard and also 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."

Similarly to NDT Expert being attracted to Querétaro to serve Bombardier, Exova moved to Monterrey in 2007 to meet the mechanical testing, metallurgical testing and non-destructive testing needs of Frisa. The Canadian headquartered testing company has since been successful in expanding its client base throughout the country. Juan de Dios Rodriguez, strategic business development manager for Exova Mexico, is noticing an increased desire for outsourced testing services. "[Internal testing] is a trend that exists today, but as the aerospace industry in Mexico matures, aerospace companies will look to outsource their testing requirements to be able to better focus on their core competences."

Nuevo Leon is certainly proving to be a strong player in the field of testing. Grupo Forem is a Mexican group that, through its component companies, offers a diversified range of metrology services and a number of mechanical tests. It is also one of the few local businesses that have been successful in achieving NADCAP certification. "Obtaining NADCAP accreditation was certainly a challenge for us," said Fausto Yépiz, deptuy director general of Metrolab, one of the group's companies. "However, we saw it more as an opportunity to optimize our existing quality system rather than simply adjusting our model to meet the requirements."

Grupo Forem has already been able to expand its service offerings to meet the needs of the aerospace industry in Querétaro, and Mexico City and is now even exploring the U.S. market. This is proof that local companies can be successful in more value-added processes and that these services are becoming more readily available.

There is also a large number of public research centers in Mexico that are becoming more involved and supportive of the aerospace sector. The Center for Advanced Technologies (CIATEQ) recently inaugurated its Laboratory for the testing of Aeronautical Technologies (LABTA). This laboratory, located in Querétaro's airport, is seeking to enhance the competitiveness of the state, and has been working with major companies such as SAFRAN, Bombardier and ITP in the field of mechanical testing. CIATEQ's director, Dr. Francisco Anton, believes: "In order for Mexico to establish a strong network of suppliers we must have more in the way of reliability testing capabilities."

Testing and quality control are vital aspects of the aerospace industry. Though testing companies are still relatively few, Mexico has leveraged its strong engineering talent pool, fostered by the country's world-class universities, to now offer these services at a level that one would expect to find in more established aerospace hubs. •

Miguel Saldamando Rangel, Miguel Saldamando Flanagan & Israel Salas

MSR: General Director
MSF: Technical Director
IS: Commercial Director
TÉCNICA TEST S.A. DE C.V.


MSR


MSF


IS

Could you provide an overview of Técnica Test-CEAT?

MSR: Técnica Test began offering non-destructive testing (NDT) services in 1993 and expanded to become a provider of quality-control equipment for the aerospace and automotive markets. Through partnerships with vendors, such as Institut Dr. Foerster, Carl Zeiss, Karl Deutsch, etc., we 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 was part of an incubator project at Tecnológico de Monterrey. Through this program, CEAT grew from a small, family project to a structured business unit. 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.

What projects demonstrate the company's capabilities?

MSR: Técnica Test-CEAT helped Sigma Aerospace establish a design center and train its 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 offered several courses including finite element and flow analysis. Técnica Test is proud to witness the continued success of this project.

What will be the capabilities of Técnica Test's new plant?

MSR: Técnica Test-CEAT will open a new Querétaro plant in October, which will possess conventional machines for the assembly of our integration and automation solutions. The new plant will also house a lab specializing on application development and testing.

IS: Many clients prefer single-supplier contracts for the provision of an entire solution, and, with 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?

MSF: 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 costumer's system.

How has research and development (R&D) grown in Mexico and how is Tecnica Test contributing?

MSF: 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 bright future for Mexican innovation and research.

MSR: Today, Técnica Test-CEAT engages in reverse engineering and conducts complex technical tests for our clients. 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 invent new solutions. The systems that Técnica Test-CEAT produces have the ability to eliminate manual inspection 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: Mexico is prepared to grow and be a mature player in the aerospace industry. The country has a wealth of talent and Mexicans are known for their commitment and hard work. As with our decision to open a new plant, Mexicans seek to fully achieve their goals. Técnica Test-CEAT plans on taking advantage of our established connections with other players to grow within the aerospace industry. •

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 of 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 inspection. We offer high-quality measurement instruments for material analysis, hardness, coating thickness amongst providing a number of other assays. We can also conduct the essential quality checks on a company's product, something that is of the utmost importance in the aerospace industry. With our office now established in Mexico, we are able to offer full product application services. We will soon be certified here in Mexico, thus allowing us to further contribute to the aerospace industry.

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-indention 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 radioactive 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 Garcia

NF: Testia International Subsidiary Manager
TESTIA GROUP
RG: COO
NDT EXPERT MÉXICO


NF

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 the fact that the country's aerospace industry has enjoyed two-digit growth annually for the past eight years. This considerable boom and the arrival of many foreign OEMs and tier one companies prompted us to explore the market. We noticed at the time that there were no available aerospace NDT services in the country and so we established ourselves here to address that gap. Bombardier was our first contract and for the first year of our operations in Mexico this OEM took up 80% of our business. Today we have reduced business with Bombardier and now have around 20 customers in the country. We currently have seven people working at NDT EXPERT Mexico and this is a number we aim to increase in the future. Our goal has been to deploy all of our service offerings from Europe here in Mexico and we are well on the way to achieving his goal.

Can you provide details about the facilities, equipment and certifications that you have supporting your operations in Querétaro?
There are three different certifications required to work in the NDT service industry: level one, level two and level three. Amongst our seven personnel we have a total of 15 certifications, a mixture of level twos and level three, covering all five principle NDT methods.
We have an office here in Querétaro and a laboratory at the UNAQ with whom we have a strong relationship. In our lab we have ultrasonic immersion tanks, portable ultrasonic equipment for carrying out tests on aircraft directly, eddy current equipment and dye penetrant equipment. We are fully equipped to carry out all of our testing competencies.

What has been the largest challenge in establishing yourself in the Mexican aerospace market?
NF- Non-destructive testing 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 also 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.

Please explain how you intend to diversify your activities in the Mexican aerospace sector?
NF-One important area for NDT EXPERT Mexico's development is to be able to offer services to the MRO and airline industry. We have been pushing to obtain certification in order to work in this sector. We were recently awarded FAA part 145, but must now seek to attain the EASA part 145, and most importantly the Mexican DGAC. With these three we will be able to diversify our activities and provide NDT services in the maintenance and repair of aircraft in Mexico. Once we have reached this goal we will begin to look to other parts of Latin America to offer our services.

How have you seen the aerospace industry in Mexico evolve since its beginnings?
RG-I 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 strong 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 since we began operations.

Do you have a final message for our GBR readers?
NF- The aerospace industry in Mexico offers countless opportunities to companies that are willing and able to operate in this sector. New plants are being built here by foreign players everyday. Despite being a subsidiary of a European group, we feel ourselves to be a Mexican company and as such are dedicated to the continued growth of this country's aeronautics sector. •

Gene Morrison

Global Aviation,
Space and Defence
Program Manager
INTERTEK

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 quality-management systems certifications to international quality standards. With regards to the aerospace industry, these certificates include the AS9100, AS9110, AS9120. These standards encompass manufacturing and service companies, MROs and warehouse and distribution companies. Currently Intertek has approximately 35 strategic customers in Mexico, but we hope to increase this number substantially. We have a strong focus on Querétaro and have recently hired a local auditor to reduce costs for our customers in the state.

How do you leverage your global capabilities to ensure companies in Mexico are receiving a value-added service?
Intertek is unique amongst other third-party certification businesses in that we tailor our services completely to the individual customer's needs. During our primary approach we integrate ourselves fully with the client to discern what we can do specifically to help them, whether this be a small family-owned company or a large multinational. Another key advantage is our large global network of existing customers. Intertek offers a networking platform through which our certified clients can meet potential customers. This has been hugely successful in Mexico and has brought a wealth of opportunity to the smaller businesses trying to break into the global aerospace supply chain.

What role is Intertek playing in fostering the growth of the local aerospace supply chain in Mexico?
Intertek's key advantage as a strategic partner is our ability to fully understand the needs and requirements of all our customers. In Mexico it has been important for us to appreciate the cultural differences and to adapt accordingly. Having achieved this we are able to offer them the best service to help them achieve their goals. We have the experience of doing hundreds of audits around the globe and our able to identify what are the best practices for any given company. It is important to note that we are not a consultancy and as such cannot give a company direct solutions, but what we can do, which in a way is more important, is train a company to solve a problem for themselves. We offer these services to them not just on a local level, but also with a global view to ultimately meet their strategic needs?

To what extent does Intertek remain a strategic partner for a company following a successful audit?
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 market 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. •

SONORA: REVVING UP AEROSPACE

"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

Image: St. Clair Technologies skilled operators making an engine harness.

IN RARE AIR

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 probusiness 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 (SIAAM) in Hermosillo, the state has many intrinsic advantages to offer.

A key competitive factor that Sonora enjoys is an 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 […] Through 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 a Demmer Affiliate's operations in Empalme, Rafael Regalado, 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. Sonora is indeed close to Arizona, a key aerospace hub in the United States, but that does not negate the fact that operating in Mexico poses additional logistics challenges not seen on the other side of the border.

"As in all domestic businesses, inventory is one of the key elements of cost control," said Paul Cappelli, director of program management of Ducommun. "Doing offshore business creates another element of expense in the amount of inventory required to compensate for the logistics flow of material getting to the production line and delivering to the customer."

In addition to inventory challenges, the developing area is just that, still developing and not all supplies are readily available. Latecoere's Ferrand stated, "We want to do more assembly and components in Mexico. One issue was that the only suppliers around did not meet the needed requirements or did not have the quality of products that we look for. The few ones able to do it did not show the expected competitiveness."

Well aware of the obstacles they face, both companies have been aggressive in resolving the issues that the region presented. Ducommun's Cappelli stated, "Our experience on the products that we have transferred has been, efficiency gains (reductions to manufacturing times, attributable to introducing lean principles) have more than compensated for the logistics and inventory costs for transferring product. In regard to the logistics solutions," he continued, "we have been fortunate to work closely with The Offshore Group, developing a robust cross-docking process, which has enabled our consolidated California shipments to cross and arrive in Guaymas within two days of shipment date."

Latecoere, on the other hand, brought one of its long-time 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 model, we will therefore be able to acquire more business and customers by being more cost-efficient."

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 Dolby, 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 harnesses 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 standardized processes, Mexico provides a great opportunity to become more competitive and provide greater value to their customers and stakeholders." •

Image: Passenger Door mechanism check. Latecoere.

Michael J. Smith & Eduardo R. Saavedra


MS


ES

MS: Director, Business Development
ES: Executive Vice President, Business Development
THE OFFSHORE GROUP

Can you provide a brief overview and history of The Offshore Group, as well as any recent major milestones?
MJS: The Offshore Group was founded in 1986 in Sonora, Mexico. The beginnings of the company coincided with the growth of maquiladoras in the country. While most of the maquiladoras were being set up along the border with the United States, our founders saw more opportunity further south in Guaymas, Sonora. Guaymas offered a stable and committed workforce. Today, over 13,000 workers contribute to the success of The Offshore Group.

What products and services does your company offer the aerospace industry?
MJS: The Guaymas Cluster is the only cluster in the country formed without the initial presence of an original equipment manufacturer (OEM) or tier-one company. It evolved, in part, through Rolls-Royce and its efforts to establish a supply chain in the state of Sonora. In light of its involvement, Guaymas has the largest concentration of gas-turbine engine suppliers in Mexico.
As a manufacturing service provider, we provide a low-risk and low-cost option for clients to establish a manufacturing presence in Mexico. We provide facilities, human capital, and import-export regulatory compliance services so our clients can focus solely on production.
We have seen incredible growth with all of our clients due to the scalability that The Offshore Group offers. Our clients are able to grow with minimal risk and we adapt our services to the specific needs of our client. Additionally, there is a strong sense of community in Guaymas. Special processing and machining companies in the cluster support the manufacturing needs of our clients. When downturns occur in the aerospace market, we offer options to scale down operations in a cost-effective manner.

What are the key strengths that you see in Mexico as a hub for the global aerospace industry?
MJS: As demonstrated by our workers in Guaymas, Mexico counts with the availability of an eager, talented, and trainable workforce. Mexico has one of the youngest workforces in the world, with an age average in the low 20s. In Guaymas, The Offshore Group is not subject to significant transient labor since most of our workers want to remain in Guaymas.

What are some of the challenges aerospace players can expect to encounter in Mexico?
MJS: The Offshore Group provides the resources, but the culture is that of the company establishing operations in the region. In terms of corporate culture, companies cannot expect to have operations the same way they have them in Canada, the United States, or Europe. Academic and technical institutions in Mexico, such as UNAQ and Tec de Monterrey, have created a vibrant talent pool but this talent pool is still young and semi-skilled, or 'skilled-trainable'. The aerospace industry is complex and the workforce needs to be nurtured so companies can see the fruits of their investments in the coming years.
Mexico built its aerospace industry through Foreign Direct Investment. Today, with foreign direct investment flows growing less rapidly, there is a great opportunity for local suppliers to enter the aerospace sector. Commitment is key to a successful entry into the industry.

What are some industry areas in which Sonora can still grow?
MJS: Sonora would benefit from a machining cluster. Moreover, The Offshore Group is committed to the growth and development of Hermosillo as an aerospace city. We will work with tier-one companies who are considering investing in the region. We consider Guaymas to have the necessary foundations to support the arrival of maintenance repair, and overhaul and tier-one companies.
The Offshore Group is looking for gaps in the value chain in order to go out and solicit the arrival of those suppliers to Mexico. Our Guaymas suppliers are increasingly working together, as a community, to add value to their manufactured products. Nonetheless, most Mexican aerospace clusters are waiting for the full commitment of an OEM or a large tier-one company to disseminate their needs into the supply chain and push for local players to compete for its contracts. Special processing of hard metals remains Sonora's Achilles heel in regards to the aerospace industry.

What are the key strengths of the State of Sonora 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?
MJS: The Offshore Group wants to establish a strong presence in Querétaro 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 that are geared toward people, including an extensive human resources department that assists with payroll and all of the legalities that come forth when having employees. Additionally, we provide transportation for our employees and have a very large daycare center, which companies had previously mentioned as an operational challenge for its workforce. The Offshore Group helps our clients with the importation and exportation of goods across the border and to deal with the Mexican IRS. So, when we approach an American, Canadian, or European company to come to Mexico, they typically already have Mexico, and Guaymas specifically, on their radar. When they come see what we do on the ground, it speaks louder than a website or a brochure.

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 this is a factor 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 a cautious one, very slow-moving and sensitive to the marketplace. They have a backlog of thousands of planes that need to be made, yet 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 skill sets. What The Offshore Group has done is found a training center full of machines and have carried out various training courses there, proving to be 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 where there is less security. 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 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 low. This year so far, we have already had two organizations that are interested in coming and setting up shop here. Business is good, so that will trickle down and encourage more people to come.

Please provide a final message for GBR's readers, the international aerospace community about Guaymas, Sonora.
ERS: 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. The Offshore Group is the largest private employer in the state of Sonora that contributes directly to the well-being of the community employing around 13,000 people in this small city. •

Paul Cappelli

Director, Program Management
DUCOMMUN INC.

Can you provide us with a brief introduction to Ducommun and its work in Mexico?
Ducommun is a publicly held company on the New York Stock Exchange (DCO) that was established during the California gold rush in 1849 and is the oldest, continuously operating corporation in California. Originally focused on mining, the company later transitioned into becoming one of the major aerospace metal suppliers during the California aerospace boom, and eventually evolved into one of the premier aerospace providers of both electronic and structural solutions for a wide array of customers.
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 business units; including post-bond machining, paint and final assembly of Boeing 737 and 777 products for the Bonded Component Solutions business unit located in Monrovia, California. Additionally, the Guaymas facility provides sheet metal fabrication, machining, chemical processing, mechanical assembly and wire harness assembly for several of the other Ducommun business units. The facility is AS 9100 Rev. C-certified and has several NADCAP accreditations.
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.

What opportunities did you see in opening a facility in Guaymas that would allow you to better serve your clients?
The clearest benefit was the cost savings that manufacturing in Mexico would afford us. When we were performing our due diligence, a couple important features ultimately brought us to Guaymas. Guaymas is a well-established town, steeped in stable family life and family values, with a 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.

While there are clear advantages to working in Guaymas as you mentioned, what are some of the challenges that Ducommun faces?
As in all domestic businesses, inventory is one of the key elements of cost control. Doing offshore business creates another element of expense in the amount of inventory required to compensate for the logistics flow of material getting to the production line and delivering to the customer. Our experience on the products that we have transferred has been that efficiency gains (reductions to manufacturing times, which are attributable to introducing lean principles) have more than compensated for the logistics and inventory costs for transferring product. In regards to the logistics solutions, we have been fortunate to work closely with The Offshore Group, developing a robust, cross-docking process, which has enabled our consolidated California shipments to cross and arrive in Guaymas within two days of shipment date.
One of the start-up challenges was finding local technical talent in engineering, manufacturing and quality. It was a time when aerospace was new to the State of Sonora. That is less of an issue today. The State of Sonora has aggressively pursued the aerospace sector and has supported advanced technical training as one of their key objectives.

Please provide a final message for GBR's readers, the international aerospace community.
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, and we are looking forward to growing our current customer base, providing them with the same excellent service for which we have become known. •

Charlie Hess

President & CEO
ST. CLAIR TECHNOLOGIES

Can you provide us with a brief introduction to and history of St. Clair Technologies?
St. Clair Technologies started in 1951 and is a producer of electrical systems, ranging from low-volume, high-complexity to very ultra-high volume and, in some cases, lower complexity. We started out exclusively in Ontario, Canada producing for the automotive industry, but began operating in Empalme 20 years ago. St. Clair Technologies has grown the business in Guaymas to the point that we have now almost 1,000 direct employees manufacturing wire harnesses.

"Innovative solutions for electrical systems" is the mission statement of St. Clair Technologies. Can you tell us what opportunities you are seeing in aerospace with regards to innovation?
In aerospace, there is over-engineering everywhere, which is a great thing from a safety perspective, but there is significant room for improvement. St. Clair Technologies is trying to penetrate the market through innovative solutions and products. To give an example, there are harnesses 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 in an airplane if the cockpit was undergoing 175°C phenomena as the protocol states—it just does not happen, whereas if 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.

Why is there such a close relationship between automotive-part manufacturers and aerospace?
In the automotive, truck, and bus markets one can obtain new customers fairly quickly, while the aerospace industry moves much slower. Aerospace requires a very mature relationship to advance in terms of obtaining opportunities, as there are many long-term agreements for projects. The aerospace industry, however, is ready for some change; the supply chain is actively looking to reduce pricing while being innovative as well through its suppliers.
Discussion is taking place with regards to using automotive suppliers to sell into the aviation and aerospace industry, given that our quality standards have basically come to a level of a zero-defect product. If one were to compare an aerospace wire harness that goes into a Rolls Royce engine versus an automotive wire harness for a Ford engine, it might be close to impossible to tell them apart: the same connectors and wires are assembled by hand, with potentially more robust features on the aerospace product. As such, most of the aerospace components are made and sourced in the United States or Europe, but most innovation comes from the United States.

What role has working with the Offshore Group played in the success of St. Clair Technologies?
St. Clair Technologies came to Sonora in July of 1996 and shipped its first part in September of that year; 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. The Offshore Group was a strategic partner from the beginning. Their team has the expertise to bring in a business, get them set up, employ correctly trained personnel, and let the company focus on its core competence. 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. As the president and CEO, I did not have to worry about these peripheral issues.

How has operating in Guaymas helped you develop in the aerospace industry?
Sonora represents an excellent pipeline because of its 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. Honeywell is there, and it loves the fact that we have an engineering and service center in Chandler, while still manufacturing in Guaymas, Sonora, Mexico. Guaymas is a great launching pad, as there are a number of highly experienced people and companies that are doing aerospace-type business. We thought it was a natural move for us to take the high-quality standards from automotive and apply them to aerospace. Through operating in Guaymas, we can find qualified talent with previous experience and can supply to major players both in Tucson and Phoenix. Finally, we have done a lot of defense and military work in the past, which allows for a smooth transition.
The goal of St. Clair Technologies is to grow and have aerospace make up 10% to 15% of our portfolio. We are taking critical steps by getting involved with the Phoenix-based organizations like Greater Phoenix Economic Council as well as the Canadian-Arizona Business Council, who have very good, existing connections. This is helping us to get the warm introductions with the aerospace players, because once we have one foot in the door, we are confident in our products and services. We just need that opportunity from a like-minded company that sees value in our local presence and cost-effective offerings. •


EP


ED

Erick Passalacqua & Eric Dolby

EP: Director of International Business
ED: Director of Sales and Marketing
ELLISON SURFACE TECHNOLOGIES

Can you give a brief introduction to Ellison Surface Technologies and what you offer to the aerospace industry?
ED: Ellison Surface Technologies was founded in 1986, offering special-process technologies to the aerospace industry, which today makes up approximately 70% of its business. We have operations in seven locations throughout the United States, Canada, and Mexico. The company mainly deals with coating and surface treatment applications on aero engine, structural and landing gear components. These types of coatings exhibit a variety of functional uses from thermal protection to wear, erosion and corrosion protection, all extending the life and enhancing the performance of the components they are applied to. Additionally, Ellison Surface Technologies has invested significantly in recent years to offer supporting processes like heat treatment, lubricant coatings and advanced laboratory and inspection capability.

Could you explain more about the technology that Ellison has developed that has never been seen before in Mexico?
ED: Ellison is commercializing 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 Roca 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?
ED: 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 rough 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 record aerospace 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 locating near 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 both aerospace and power-generation platforms. 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 supply chain. Ellison is intentionally focused on listening to these OEMs and making sure that it invests in technology and expertise that will bring sustained growth to the company and the region.
EP: We will also continue to develop our employees and give them opportunities to advance their skillset and certifications. Ellison has a strong desire to bring prosperity and advancement to the local community in Guaymas. •


BF


OB

Bruno Ferrand & Octavio Baro

BF: President and CEO
LATECOERE INTERNATIONAL INC.

OB: General Manager
LATECOERE MEXICO

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 immediately triggers a negative perception. The product that we were targeting when we decided to open operations in Mexico was the doors for the Boeing 787. It is the most high-engineered item in this range of products.
OB: If you asked us what the future looks like for manufacturing in the aerospace industry, the model that we are operating under in Mexico would be our answer. The plant manager is in charge of two different divisions. Instead of a plant focusing on harnesses or solely on doors, our plant has a number of different foci. It is an honor to be in Mexico where this has been able to become a successful reality.

You say that Mexico was the best-cost location, but why Sonora?
BF: We looked at the aerospace footprint in Mexico. I was impressed with Querétaro, but there are a lot of big players there and there was already a plant with a wiring shopfloor and another company building doors. We did not want to be somewhere where we would have to fight for people or having problems with workforce availability. Also, Querétaro has a higher cost associated with it. Safety was another big factor for our employees. We wanted to make sure that we did not choose a place famous for unrest. The willingness of the government to set and develop aerospace in Hermosillo was also an important factor. They were very efficient and supportive in many manners in many areas, specifically with establishing an aerospace training facility (SIAAM) very quickly.

What challenges are unique to Mexico and how can they be solved?
BF: We want to do more assembly and components in Mexico. One issue was that the only suppliers around did not meet the needed requirements or did not have the quality of products that we were looking for. The few ones able to do it did not show the expected competitiveness. To resolve this, we brought one of our long-time partners to Mexico, who are actually to be located across the street. We will be able to receive components from them and they will be in very close proximity. As this industry picks up speed, we will have to strengthen our relationship with suppliers in order to ensure outstanding performances control. We will be able to work together everyday and, if there is a problem or shortage, we can cross the street and fix the issue. This is the 'extended enterprise' concept. Once we use this technique to get a price-effective model, we will acquire more business and customers by being more cost-efficient.
OB: We are focused on beating cost, time, and workforce efficiency. It is a challenge to take care of these three factors, especially since we are new. This is risky because being here and trying to get suppliers presents resistance so we need to ask what our strategy is whether we stay with those who are around us or begin to take matters into our own hands.

Where do you see growth coming from and what are your strategies to keep growing?
BF: We also know that we need to continue to be more aggressive, especially when it comes to getting more business in North America. We are currently working to increase and develop our business, and Mexico is helping us a lot. Customers who know about our production in Mexico also know about the crew, quality, and trust that they can have. This is especially true with Boeing. They were cautious from the beginning because they could not imagine what was going to happen when we moved production from France to Mexico, but they saw that we succeeded. They have been available and involved in every step of the way from day one. When we were building our facility, when we installed our equipment, when we kicked off production, they saw the progress. Now, we are one of their favorite facilities. •

Image: Equipos Inoxidables del Norte SA de CV, ACV Group

LA LAGUNA: THE CREATION OF A NEEDED HUB OF LOCAL PLAYERS

"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 successes 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 Guerrero, 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.

Image: HASEIN

High expectations directly correlate with the growth and expansion plans for these companies. Kirbymex 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.

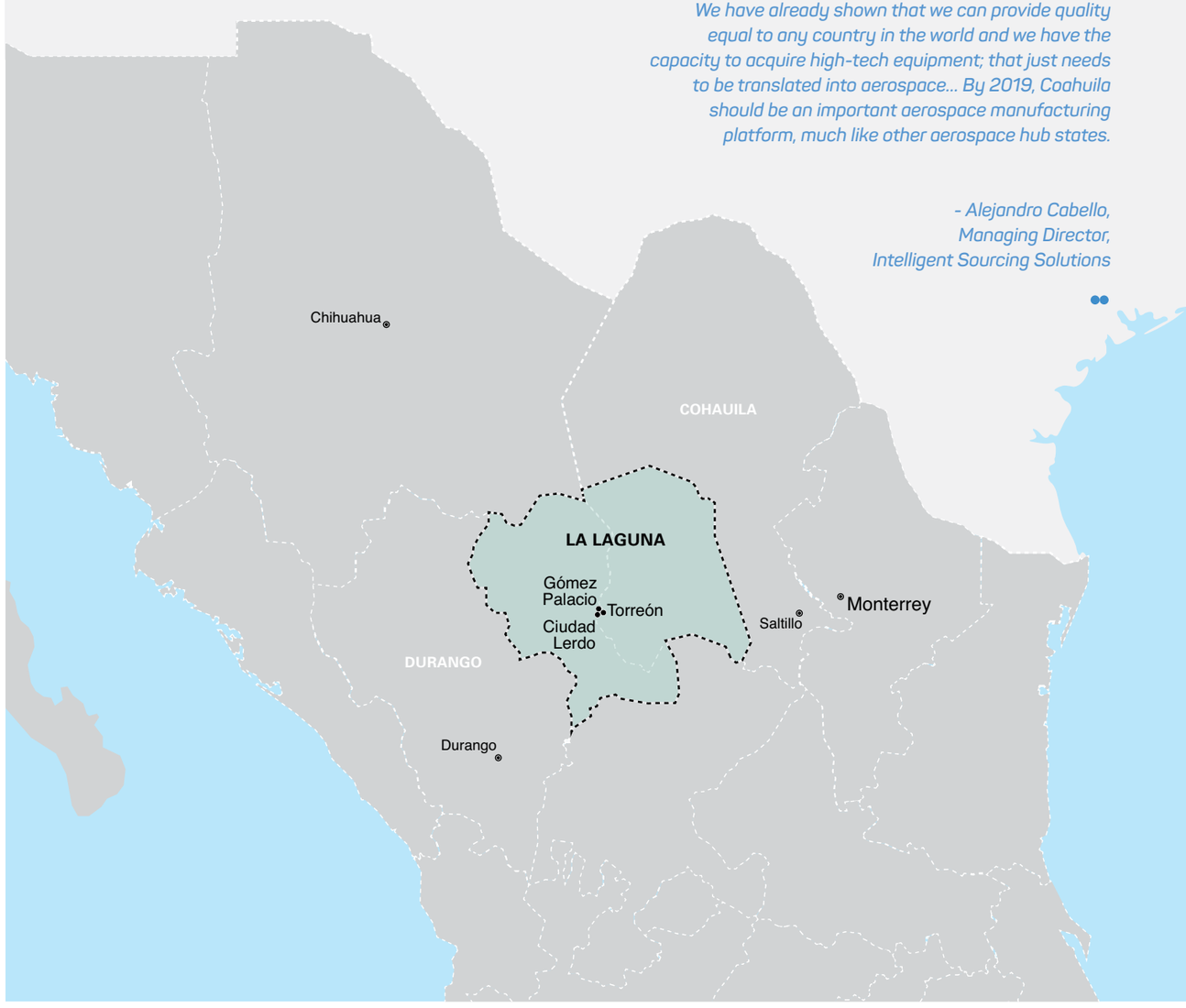
Habilitaciones y Servicios Industriales (HASEIN), a family-owned company founded in 1977, is one of the only cluster members presently servicing the industry, manufacturing approximately 150 different aerospace parts. "Just two years ago, we moved to a new facility which encompasses all of the computer 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 Jaime 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 supporting 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 seats. "If you look at an airplane, there are stitches everywhere," explained Jose 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."

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.

- Alejandro Cabello, Managing Director, Intelligent Sourcing Solutions



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 to strategize 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 Elvia Meza Meléndez, director of ProMéxico for Coahuila, "He is a strong businessman with impressive foresight. 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 overachieving."

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," posits Alejandro Cabello, managing director of Intelligent Sourcing Solutions. •


JC


ZC

Jaime Carrera & Zaide Carrera

JC: CEO
ZC: Director of Sales
HABILITACIONES Y SERVICIOS INDUSTRIALES (HASEIN)

Can you provide a brief history of HASEIN and its operations in Mexico?
Habilitaciones y Servicios Industriales's (HASEIN) founder, Jaime Carrera, started providing carpentry services in 1977 and subsequently expanded into production processes for metals and plastics. HASEIN has now been a manufacturing supplier in the medical industry and the aerospace industry for the past 11 years with GE Healthcare, and for the past five years with Rockwell Collins, achieving the appropriate certifications along the way: ISO 9001:2008, AS9100 and the Clean Industry certification.

Dedicated to manufacturing, can you explain the diversity and size of your product/service offerings?
HASEIN manufactures products for a variety of industries, including mining, medical, aerospace, food and beverage, industrial packaging and machinery, and product-design. HASEIN offers injection and blow molding, deep draw, conventional machining, computer numerical control (CNC) machining, wood, and metal mechanical, among others.

What certifications were necessary for HASEIN to be able to work with its international aerospace clientele?
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 manufacturing 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, possibility opening another plant in the United State 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 manufacturers' 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 improvement.

Can you describe both HASEIN's inspection and testing measurements?
HASEIN uses scanning processes and a coordinates system, which ensure that client specifications are perfectly satisfied. Aluminum parts are sent to an external supplier for finishing, including anodization. Once we get the parts back, they are tested and certified for quality, before they are shipped to the customer.

How have technological and machining advancements improved the productivity of HASEIN's operations?
HASEIN began by 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 kind of advancements have been critical for our success, which is why we keep an open mind and progressive attitude towards 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. I have seen the interest of other companies, which are already seeking certification to participate in the aerospace industry as suppliers. 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. In fact, our main challenge is finding qualified technicians. Even those that are the most prepared still lack significant knowledge. Most employees arrive with about 30% preparation completed, and HASEIN finishes the necessary training. La Laguna needs clearer dialogue between the universities and the sector's actual needs.

Do you have a final message?
HASEIN has 40 years of experience. Thanks to the quality of its products and services, it is now one of the most important suppliers in the region. We want to reassure our commitment to our clients and thank them for the opportunity and trust that they have instilled in us.
It is important to have additional and better sources of jobs in Mexico, and HASEIN is doing its part to accomplish that goal. We want our company, region, and country to be seen as qualified suppliers for companies worldwide. •


GD

Gerard Didienne & Javier Garcia

GD: Plant Manager
JG: Commercial Manager
DELTAPLAST MEXICO

Can you provide a brief background to Deltaplast explaining its 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 2009, when a long-term business relationship with the aerospace company Radiall was formed.
On March 2015, PSB Industries acquired Plastibell Group, which positioned the company as a major player in plastics for the healthcare, 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 and Mexico reported consolidated revenues of 262 million Euros in 2014, 60% of which corresponded to international sales.
The growth strategy for PSB INDUSTRIES is to achieve a turnover of 600 million Euros by 2020.

How important is the aerospace industry to Deltaplast's operations?
The aerospace industry represents about 20% of Deltaplast's business. The automotive industry is still our biggest division and contributes 60% to 65% of our operations. We expect to grow significantly, with 30% in the aerospace industry over the next two years, and are aiming for a steady balance between the aerospace, automotive, and medical-devices industries.

Deltaplast does contract-injection molding. 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, and Radiall is responsible for the rest of the process. Our aim is to diversify our market and evaluate any new potential aerospace partnerships.

Can you elaborate on Deltaplast's Mexico facility and any attained certifications?
The facility is 4,000 square meters. Currently we have 33 presses ranging from 50 tons to 350 tons. Deltaplast is planning to grow and expand its operations into other regions of Mexico. Radiall, which is our main customer for aerospace parts, is already operating in Sonora and successfully pushed for us to move closer to them.
Deltaplast has an investment to establish a new facility there that will help it to consolidate its 2020 vision. In 2015, we had a turnover of $12 million, which grew to $16 million in 2016 and is projected to be $24 million in 2017. For 2020, the aim is to have a turnover of about $50 million. To achieve this, expansion is practically required.
Over the years, Deltaplast has obtained the international standards ISO9001, TS16949, ISO 13485 and AS9100. With years of experience in the automotive industry, Deltaplast has a successful transition from TS16949 certification to AS9100, and was the first company in Mexico to produce plastic parts with this certification.

What are some of the challenges of working in both the automotive and aerospace industries?
The automotive industry involves high volumes, compared to mix of volume of aerospace. Operations in the two sectors are different, and Deltaplast tries to be price-competitive by strategically assigning the right resources. The management and cycle of production differs in the two different sectors, and thus we have two separate the process of production. The aerospace industry utilizes more technical parts, and the raw materials used are different.

What are some of the strengths that La Laguna offers to potential investors?
The human resources available in the area 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 aerospace. In terms of logistics, transportation of raw materials and supply chain costs, Coahuila is economical compared to other regions. Index has a target to grow the Mexican aerospace industry so that it can produce every component inside an aircraft, but more suppliers are needed.

What goals would Deltaplast like to achieve over the next five years?
Deltaplast has already doubled its sales in only two years, and expects to again double its sales in 2017. The company wants to acquire more presses, and is finding it necessary to start expanding its facilities and move closer to its customers. We are eager to further develop our customer base in the aerospace industry.
Deltaplast's expansion strategy is to purchase an existing company or, if we are growing, we can rent a building. We want to grow in aerospace, but also in the medical-devices and automotive sectors.

Do you have a final message?
Deltaplast has a positive feeling about the aerospace market in Mexico, and there are still ample opportunities for growth. Mexico is prepared for the transfer of operations as many companies already have the structure to start operating. Deltaplast aims to improve year-on-year to meet the industry's demands, which could mean consolidating a partnership as part of its growth strategy. •

Alfonso Cabello Guerrero

Business Development VP
EQUIPOS INOXIDABLES DEL NORTE SA DE CV, ACV GROUP

Can you provide a brief history of Equipos Inoxidables del Norte's presence in Mexico?
Equipos Inoxidables del Norte, ACV Group (ACV) is a family-owned company that was established 46 years ago. The core focus of the business was fabrication of stainless steel tanks and piping for the water and oil industries. After 20 years, we started to enter the American market with companies like General Electric, which is now our biggest client. Working with world-class companies taught us various techniques and continuous improvement methods that allowed us to improve performance in quality, costing and diversification strategies.
Three years ago, we acquired one of the biggest industrial complexes in the north of Mexico with the main initiative of diversifying into the automotive and aerospace industries. Expansion projects required ACV to not only consolidate its processes and products, but to make a significant investment in terms of time, training, equipment and certifications. Currently, ACV has a team of 500 employees fabricating enclosures, machined bases, insulated ducts, train components, parts for trucks, tanks, skids, grids and cabinets. We are focused on the oil and gas, water treatment, energy, chemical, transport, and medical sectors, shipping mainly to United States and Europe. We are in the process of transitioning our capabilities into the aerospace sector through AS9100 certification and process specialization and segregation.

Can you explain the diversity and size of your product and service offerings as well as the processes that ACV expects to transfer into the aerospace realm?
ACV manufactures a wide range of products in different sizes, volumes, complexity and type of materials; from small production-line products, to large and heavy fabs, and several part assemblies, all of them with high value added. We also offer services such as HD plasma and laser cutting, bending, rolling, machining, certified welding and liquid painting and international trade skills. These services can either be internal, for our own production, or external, for client projects. With regards to the aerospace industry, the aim is to add capabilities such as automation processes for welding, a certified laboratory for DT and NDT, and computerized powder painting.

What certifications correspond with this work?
We are certified based on many international standards such as ISO9001 and ISO14000, ASME and AWS. We expect to obtain AS9100 in June 2016.
ACV has received significant support from ProMéxico to obtain certifications. ProMéxico is also inviting us to events in order to obtain information, international shows, feedback, and ideas for ACV to become more targeted in achieving its transition goals.

What is ACV's strategic plan for investing in the aerospace sector in the coming years?
ACV aims to invest in automated material-handling subsystems, automated welding processes and improving our quality system. The aerospace industry quality requirements differ from other industries. Currently ACV is producing a very wide mix and a low volume of parts for different sectors, but the aim is to have specialties where we produce high volumes through automation.
The expectation is to invest $7 million to $10 million in 2017. ACV aims to acquire co-investors for 2018 and achieve a level of $25 million to $30 million of investment. We have a facility of 1 million square feet, of which only 35% is currently being used for production. The goal is to expand our operations in the facility and install new processes and laboratories to meet the demands of the aerospace industry. We want the aerospace industry to contribute 25% to 30% to our operations within the first three years.

How is ACV going to transfer specific skills that are needed for operating machines? How have technological advancements in machining improved the productivity of current operations?
New technologies surely improve production times. ACV is always looking to improve and is constantly searching for new technologies to help it be more efficient for its clients. Our production control team develops the plans to achieve 100% on-time deliveries, and our continuous improvements team works to make processes faster.
With regards to the aerospace industry, our machining and welding processes will be automated to improve efficiency. ACV's human capital will be responsible for assemblies of electronics and hydraulics and NDT processes. The company will internally train its employees to be self-sufficient in the production processes, testing processes and complying with and the maintaining of certifications. ACV has three training academies where it aims to educate at least 100 employees at the same time to create better human capital within our business.

What processes and services does ACV offer that are not available in other facilities in the region?
Manufacturing of steel and aluminum is widely available in Coahuila and there are several manufacturing companies in the state that can process these materials for different sectors. What differentiates ACV from competitors is that it has the best welding processes according to its 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. •

José Luis Benítez Rodríguez

General Director
INDUSTRIAL B&S DE MÉXICO

Can you provide a brief history of Industrial B&S and its operations in Mexico?
Industrial 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 companies.
Industrial 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, electric 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.

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 customers that we are prepared. Through delivering the best products and services to our current clients, we can showcase our capabilities. We can comply with the specifications, demands, and requirements of our customers, which can add value to their products. Industrial B&S has been preparing its operations and employees for the aerospace sector for over two years as to go above and beyond requirements.

Can you talk about the collaboration and formation of the Laguna region cluster?
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 products are not sold within the region, but rather sent to other parts of the country. The Laguna cluster will be a reference for other clusters, as we share a significant amount of 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 challenge in the region, and what other challenges does Industrial B&S experience?
Final testing is a great challenge for all the industries present in the region, and we need to invest in this area and develop the local supply chain. Major customers have required testing capabilities, and this is definitely an aspect to which we should attend.
Training of workers is another key aspect that deserves some more attention. Workers should be trained for the specialized requirements of the industry. Academic institutions are looking for innovative projects, and we are working to create relationships with the industries. As the aerospace industry needs specialized capabilities, collaboratively working with academic institutions is a necessity for aerospace growth.

Can you elaborate on the current capabilities of Industrial B&S's facility, 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 very easy to program—mainly 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 Laguna 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 focuses only on our specialized machining services. With regards to services such as assembly and painting, we are looking for specialized suppliers as to be our partners. There are many companies in the region that we can partner with to supply to our demands.

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 as we are making great efforts to grow within the industry and supply better and cost-efficient products. •


AC


EJ

Alejandro Cabello & Enrique Juarez

Managing Directors
INTELLIGENT SOURCING SOLUTIONS (ISS)

Can you give a brief introduction to Intelligent Sourcing Solutions (ISS) and how the company has evolved since its establishment in Mexico?
Intelligent Sourcing Solutions (ISS) was founded in 2008 by people who were experienced in metal manufacturing processes. Sourcing is a critical aspect for both customers and suppliers, and we saw an opportunity in this market. ISS started as a global logistics, transportation solutions, and industrial-sourcing services company. Logistics in Mexico are challenging, as there are many complex federal requirements including NAFTA certification and declaration.
We are dedicated to revolutionize response times and punctual deliveries to our customers.
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.

Can you explain the diversity and size of your ISS' product/service offerings at present?
We are a group (ISS-ALDAJO-ISEEMSA-PCSA) of companies who works together to intensify efforts and get better results. Our sourcing and logistics division offers integral supply chain management and solutions such as: air, ground and sea transportation, expedited logistics solutions as air charter services, air hand carry and ground hot shot, export and import management, lead logistics provider, warehousing and distribution, international purchasing's, and regulatory and tariff classification.
ISS is a sheet/plate metal structural fabrication and engineering design company. Manufacturing capabilities include specialized 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, mechanical components, process design, and specialized software. The specialized software's includes NX (Nastran), Inventor, Dessauls Systems, CAD/CAM and CAE (Computer Assisted Engineering). All ISS' fabrications are in preparation to emigrate, as we have a strategic plan to ultimately fabricate products for the aerospace industry.

What is the scale of Intelligent Sourcing Solutions' facility? What is the ISS current production capacity?
Our current facility is approximately 2,500 square meters and there are plans for future expansion. ISS wants to increase its current production areas and aims to construct a metrology and measurement laboratory that verifies diameters, lengths, position, ratio and some other requirements according to customer's needs. It is part of our strategic plan for 2016 to acquire more testing tools and equipment.
The availability of testing tools and equipment in the Laguna region is a gap in the local supply chain. ISS has submitted some projects to federal innovation entities and has already received extraordinary benefits and support from Coahuila´s government. It also has other open projects waiting for authority approval. ISS is investing heavily in innovation and its strategic plan is to grow within the aerospace industry. The aim is to innovate and create equipment that can add value to our manufacturing processes.
ISS currently services about 22 customers, including Siemens, General Electric, and Mitsubishi. The majority of our customers is operating in the energy sector and utilizes our specialized water-jet services. Cutting services are in high demand in the region and there are not many companies offering these services. ISS just attained AS9100 certification and we are in the process of creating a presence in the aerospace sector. As to meet the demands of the aerospace industry, we are in the process of acquiring a high-tech bending machine. A capability that is also on high demand and will complement our solutions is finishing processes. We should invest in the final protection of the parts and fill this gap in the local supply chain.

How will the aerospace industry in Coahuila evolve over the coming years?
The support of the Mexican government is very important to the aerospace industry, with special thanks to the Coahuila state authorities. If there is continuous reciprocity between the government and companies in the region, La Laguna will become a strong aerospace cluster. We have already proven that we can provide quality equal to any country in the world and have the capacity to acquire high-tech equipment. With this mix, we can compete in the global markets. There is a great synergy in the cluster, and this has the result that the aerospace industry is a significantly fast growing sector in terms of revenue and overall capacity.
According to the Coahuila government's vision of the aerospace sector, the participation of current and new companies in aerospace manufacturing should start to significantly increase. The aim is that by 2019, Coahuila should be an important aerospace manufacturing platform much like other aerospace hub states. Coahuila has the potential to be at the same level as the current aerospace clusters in Mexico and in addition, the geographic location of Coahuila is an advantage due to its proximity to the border. •

Arturo Dueñes

General Director
KIMBALL SOLUTIONS

Can you give a brief introduction to Kimball Solutions and how the company has evolved since its establishment in Mexico?
Kimball Solutions began its operations in 1966, manufacturing farm equipment for the domestic market. In 1985, there was a significant amount of changes in Mexico related to exports and free trade, granting Kimball the opportunity to diversify our product portfolio. We had the capacity and labor capabilities to manufacture products that were not related to farm equipment and we began to partner with American companies that were taking advantage of free trade agreements and looking at supply chains in Mexico.
At that time, most American companies were looking at Mexico's supply chain, as the country could offer very cheap labor. Since then, Kimball has been manufacturing equipment for about three to four companies that shut down their manufacturing facilities in the United States. However, the trend in manufacturing has changed, and customers have shifted focus from cheap labor to certified labor, especially regarding the aerospace industry.
Kimball has heavily invested in machinery and training its staff to keep up with global trends. Companies operating in the aerospace industry require high-tech machinery as well as specialized and skilled workers, making training a basic necessity for all Mexican operations. Another key driver for a company to be successful in Mexico is to have laboratories for inspection and measuring.

What were the first machines that Kimball Solutions purchased, and what gaps in the supply chain did you hope to fill?
Kimball Solutions saw a need for specialized machining in the aerospace industry and we took advantage of that opportunity. The first machines that Kimball Solutions purchased for our aerospace operations were Mazak CNC machines. Every single product that leaves our plant is inspected and measured under very tough circumstances in our new laboratory.
To become a major player in both the aerospace and automotive markets, certifications are very important. Kimball Solutions had the equipment and skilled human capital to diversify our operations to other industries and the aim is to become certified in all aspects as to fill a gap in the supply chain. Not to mention we are already members of FEMIA, which shows our commitment to this evolution.

Kimball Solutions has CNC machines, over 80 welders, painting capabilities etc. What work do you hope to have from aerospace companies?
Our main focus is firstly to supply machine parts to the industry; secondly, our attention is on assemblies. We have expertise in very large parts, but that is not yet our focus within the aerospace industry. Our philosophy is to first learn to walk before we start running. Eighteen years ago, Kimball solutions started to manufacture only hydraulic tanks for an American garbage company. Over the years we have evolved with the company and currently we are manufacturing their entire units that are supplied all over the United States. We need to have knowledge of the end user for the unit as every single state in the United States has different regulations for noise and sizes, etc. We expect similarly tailored specifications to come from aerospace clients.
Kimball solutions would like to offer the aerospace industry as much as it can, but it wants to be experts in a process before it offers it as a service to our customers. We can start supplying machine parts to the aerospace industry as we already have the infrastructure and capabilities. Kimball has multiple 2-axis and 3-axis CNC machines, break presses capable of supporting 200 tons, a Faro machine, and our AS9100 certification.

Can you elaborate on the training that is required specifically for the aerospace industry?
Kimball Solutions invests heavily in the training of its staff, as they need as much knowledge as possible to supply certified parts to our customers. Any company can manufacture machining parts, but it does not mean that they have certification for the specific part. In order to supply certified parts, one has to be able to provide testing reports from a laboratory.

Is the government collaborating with the cluster and trying to develop the industry further?
We are about seven companies that are trying to get the Torreon aerospace cluster going, but we do not yet have all the required services in hand. The local government will be willing to encourage the development of the industry and will provide their support to the cluster. The cluster receives support from ProMéxico, and the federal government is also heavily pushing the aerospace industry aiming to create jobs and attract foreign investment. We are not yet in a position where we have contact with the government, but the government would be very interested in collaborating with the cluster in the near future.

Do you have a final message for our international aerospace community looking at Torreon as a potential aerospace destination?
In the near future, the La Laguna region will find all the services that are required to improve the local supply chain, including assemblies, machining parts and specialized parts. La Laguna used to be a great region for the textile industry, and the textile market is now again starting to develop within the region. •

Carlos Roberto Braña

Director
KIRBYMEX S.A. DE C.V.

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 in the agricultural sector through a joint venture with an American company; therefore, Kirbymex began to assemble and sell cattle-feeder mixers in Mexico.
In 2003 Kirbymex started to manufacture custom designed parts for various customers and grew significantly within the industrial sector. Our operations are mostly high mix, low volume. With more than 15 years of metal mechanic experience in the industrial and agricultural markets, we aim to provide quality products to our customers according to their requirements. The company is committed to high-precision specifications, low-cost production and short delivery times; this policy has allowed us to become one of the most reliable suppliers worldwide. Our advanced technologies and excellent labor force enable us to be effective and provide added value services to well-known brands as Caterpillar, Regal Beloit, Tug Technologies and Volvo Construction Equipment.

Can you elaborate on the capabilities and equipment that Kirbymex has within your facility?
Our facility currently has 8,000 square meters (sq. m.) of floor space and by the end of March 2016 we will have expanded to 11,750 sq. m. In this additional 3,750 sq. m., we plan to add a large machining center and reserve space for new projects. The operations in our facility include: cutting, bending, grinding, machining, welding, punching, assembly, cleaning, painting and finishing. Our cutting machines are capable to take on projects of any size and/or thickness. We have five bending machines that allow us to handle parts with great length and thickness. We also have computer numerical control (CNC) lathes and machining centers of various sizes to support our operation. We use in-house designed tools for robotic welding processes that allow us to carry out projects from all sizes—from diesel engine supports to large and heavy airport-tractor chassis. All materials and products can be cleaned and finished through sand blasting, shot blasting, phosphating and painting
To support our commitment to on time delivery and quality products we use top of the line technologies and first class materials such as carbon steel, galvanized steel, stainless steel, and aluminum. Kirbymex has its own warehouse facilities and two quality-control laboratories that are equipped with state-of-the-art tools that perform measurements and extensive testing on all our products.

In which technologies does Kirbymex wish to invest and what capabilities do you hope to transfer to the aerospace market?
In the coming year Kirbymex will invest in welding robots and stamping. We also have plans to invest in fiber optic lasers. The company will expand significantly with regards to CNC machining centers and the first additional unit will be operational by late March 2016. This center will be capable of completing horizontal and vertical four-axis jobs, which will meet the current demand. With regards to the aerospace market, in addition to GSE, Kirbymex is looking to grow in other segments; therefore, we will increase our punch-press capacity as well as our machining centers and forming machines.

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

Can you elaborate on the in-house training of Kirbymex?
Our personnel are one of our most important assets. Our facility houses 230 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 Kaisen Multi-Functional Teams, SPC, 5S, and Six Sigma Black Belt projects. Continuous 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 aerospece community?
Investors who are looking for reliable and eager additional suppliers will be surprised when they visit La Laguna and witness the capabilities that the area has to offer. •

José Juan Marcos González

CEO
SIETE LEGUAS

Founded in 1958, can you provide a brief history of Siete Leguas and its evolution?
Founded by my grandfather, Antonio Juan Marcos, Siete Leguas specializes in the manufacturing of clothing, mainly denim products, for the international fashion market—including GAP, Levi, Ralph Lauren and American Eagle—covering Europe, Asia, and the Americas. We no longer simply manufacture jeans, but rather we are responsible for the entire process, from product development and design to packing and shipping.
Siete Leguas was founded in 1958, but I like to think of Siete Leguas in two different respects: prior to 1994 and post 1994—the year in which NAFTA was passed. NAFTA was key to the success of our company, and with its passage we began steadily increasing our exports to U.S. and European markets.
Between 1994 and 2005, Siete Leguas went from approximately 400 employees to 4,000 employees and its financial success enabled the business to start a diversification process, entering new industries beyond textile manufacturing. Siete Leguas has now been present in the construction industry for 15 years and the mining industry for 12 years. Employing approximately 6,000 people, we have become one of Mexico's most important businesses. With this track record of growth and diversification in mind, we are excited and eager to break into the aerospace and automotive industries in the near future.

Why were aerospace and automotive chosen as target industries?
Siete Leguas is extremely adaptable with an incredible capacity for production. We have evolved to become a worldwide jeans supplier to top brands, capable of manufacturing 1 million pairs of jeans per month. With this in mind, imagine the immense equipment and efficiency of our business possesses. Siete Leguas will not need to expand its manufacturing capacity to enter into the aerospace and automotive sectors; rather, using the existing equipment, Siete Leguas will offer clients in these industries what they need. It is a natural expansion. Yet, that is not to say Siete Leguas is opposed to investing in any equipment necessary for fulfilling clients' demands. The aerospace industry is taking-off in Mexico, and fostering its growth will be beneficial for both Siete Leguas and the country's overall advancement and stability.

Which machines and processes will directly transfer into aerospace solutions? What additional investments need to be made?
Being the textile manufacturer it is, Siete Leguas has the sewing and cutting equipment, as well as laser-printing technologies, necessary to manufacture aircraft cabin interior pieces like seats, rugs, air bags, and anything else that has stitches. Coming into the industry via this route is the most obvious and safest entry point. Given the capabilities and machines we have experience with in our facilities, the possibilities are endless. We have a large range of productive processes such as cutting, embroidery, sewing, hand sand and all dry processes, special finishing, 3D finishing, packing and finishing; we have a distribution center, water treatment plant, development center, trim warehouse, etc.
Having worked with high-end fashion designers from New York City, we are well-versed in the particularity of perfection. Clients send us their rough designs, and within two weeks our staff sends mock ups and samples outlining variations of their ideas. The aerospace industry has a similarly custom demand for each brand of each aircraft, and we are surely capable of matching design with delivery.

Please provide a final message.
Siete Leguas has the custom-design capabilities, machinery, human capital, funds and raw material suppliers necessary to break into this industry. The company's record of success with past diversification ventures is a good indicator. We would like potential clients to know we are willing to invest in the equipment necessary to meet their needs if need be, and Siete Leguas is looking forward to the fruitful challenge ahead. •

CONCLUSION: MEXICO STAKING ITS CLAIM IN THE GLOBAL AEROSPACE INDUSTRY

"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

Image: EZ Air

HUMAN CAPITAL TRENDS IN THE AEROSPACE SECTOR

By José Flores, President, Corporate Recruiters

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, 50% of which are for engineering careers and 1.6% 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, 79% 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 IDEA 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 competence: personal, position-related, manufacturing sector, management, and global competences. 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 and opportunities to develop soft skills mainly 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.

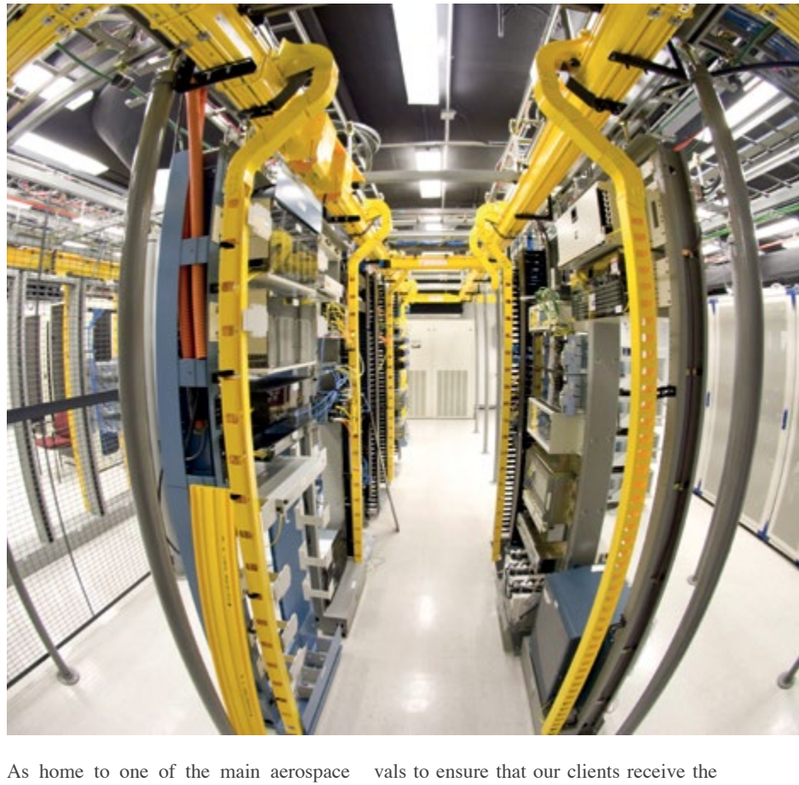
Companies will have to put in place training and developing programs to foster soft skills such as global awareness, languages, multicultural team working, business sense, IT tools proficiency, information literacy, analysis, decision making and critical thinking. In the market these competences will be highly demanded commodities, therefore companies with the right training programs to develop and recruit professionals with these skills will prevail over their competition. •

If you want to know more about this article please feel free to write at joseflores@global-recruiters.com

[1]The Competencies' Pyramid is a trademark model of Corporate Recruiters for the best assesment and evaluation of executive talent, to consult it visit www.global-recruiters.com/our-services

Alejandro J. Guzman

Commercial Director
TRANSTELCO



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 multinationals in the country. These companies need high-quality, real-time communication systems to run their operations. Transtelco offers the latest technologies to improve the communication and transaction requirements of international companies.

What services does Transtelco offer its clients?

Transtelco connects a customer in Querétaro to its U.S. branch through a single-fiber network. Communications flow directly between both countries without the need to interconnect with another Telecommunications provider, which would be responsible for taking the services to the other side of the border. Our bi-national network augments the value of the services we offer our customers.

Transtelco owns the infrastructure that it operates. Therefore, our company does not need to lease third-party networks. We can react and quickly repair problems when they arise. More importantly, Transtelco offers the best latency compared to its rivals to ensure that our clients receive the fastest delivery of their information and transactions.

What are some major challenges that Transtelco has encountered in the aerospace sector?

When Transtelco first arrived in Querétaro, large aerospace companies in the region were building and operating their own fiber networks. Local providers could not offer the speeds and reliability required and, if they could, they charged exorbitant fees for the bandwidth. Transtelco can offer the amount of bandwidth that corporations need to succeed in the industry and avoid efficiency losses from running a proprietary fiber network.

What are some major milestones for Transtelco in the next five years?

Transtelco plans to expand its infrastructure and grow its commercial market in both the United States and Mexico. Our company will continue to simplify communications between both countries so our clients can focus on their business operations. •

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.

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.

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 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. More are indeed coming to realize that "Hecho en Mexico" means made with precision; made with intent. •

"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."

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THANK YOU

We would like to sincerily 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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