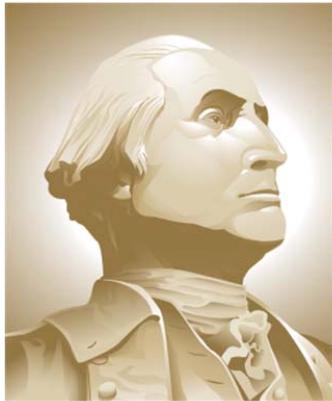


THE CENTER OF LATIN AMERICA ISSUES

MINERVA PROGRAM

FALL 2012



**THE GEORGE
WASHINGTON
UNIVERSITY**

WASHINGTON, DC

**The aerospace Industry in Mexico:
Baja California, Chihuahua, Sonora & Queretaro**



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**The aerospace Industry in Mexico:
Baja California, Chihuahua, Sonora & Queretaro**

This paper focuses on presenting an analysis of the aerospace sector's global trends, including the effects for Mexico. Finally, it points out the differences between the main clusters of the country.

This industry is very dynamic and it involves a lot of different players and factors that affect its growth and development, that's why this paper it's a glance of this particular time.

The global aerospace industry

From a production standpoint, the civil aviation is at its peak. In 2011 it recorded its highest level and second best year in terms of airplane orders. It is estimated that large commercial airplane manufacturers will produce between 26,900 and 33,500 commercial airplanes in the next 20 years.

The industry is evolving according to the needs of the consumers and the economic times that we are living. In recent years, the Boeing–Airbus duopoly has lost considerable power over a somewhat fragmented supply base, but the duopoly is disappearing as other companies like Bombardier and Embraer are entering a market that exceeds \$200 billion and is expected to grow annually at a rate of 3.6 percent over the next 20 years.

The aerospace industry is getting more global because of the to the international competition and a higher demand in emerging countries. This process creates pressure to become more efficient.

Mexico ranks 7th overall in industry size, being the 11th largest economy as measured by GDP.

The aerospace Industry in Mexico

The aerospace sector is the fastest growing manufacturing industry in Mexico. The industry is associated with highly skilled and well-paid employment, and several training and education institutions in Mexico provide specialist training and collaborative links with industry.

Mexico has joined the group of countries that are in this industry as global leaders. It has recorded growth of almost 20% annually in the last seven years. Today, there are 249 companies and support entities in the country, most of which are NADCAP and AS9100 certified. They are located mainly in four states and employ more than 31,000 high-level professionals.

Mexico is well known as a manufacturing country, engineering and development is one of the most value factors that it has. This is due to the degree of technological sophistication of its exports, engineering talent (Mexico has the largest number of graduates in the Americas) and the quality and competitiveness of its workforce. By 2011, exports from the Mexican aerospace industry reached a value of 4.337 billion dollars. Foreign and national investment in the sector exceeded one billion dollars in 2010 and 3 billion in the last three years.

According to estimates from the Ministry of Economy (SE), the industry is expected to report exports of 12.26 billion dollars in 2012, with a 14% average annual growth rate.

Mexico's geographic location and manufacturing advantages have made it the ideal location to produce dual use goods and restricted technologies, that is, products and services that can be used in both civil and military applications. Due to this potential, a regulatory framework now exists which ensures the good use and final destination of sensitive goods produced in Mexico.

Mexico is in the process to enter in a group of countries which prevent the proliferation of weapons of mass destruction but support high-tech civil and military projects. This group is named "the Wassenaar Arrangement (WA)".

Mexico's integration to the WA confirms the country as a reliable destination for the integration of sensitive technologies. Mexico's exporting industry will have an access to a potential market of 11.3 billion dollars annually, in addition to the potential to create between 30,000 and 40,000 highly paid jobs

Mexico's plans to keep growing

The main plan keeps its attention on turning Mexico's aerospace industry into a country that operates the complete cycle of an aircraft. Some global market trends for the sector that are developing in the national industry are the followings.

Restricted use technologies and the use of new materials

In Mexico a new export control system was implemented as part of the efforts to attract more investments in restricted and dual use high technology. Mexico was able to optimize the attraction of more profitable and strategic investment projects, with a higher potential for promoting industrial competition through technological and economic compensations.

New materials - such as Nano compounds - are classified as dual use because they can be used in both civil and military aviation. They have become lighter and quieter to perfect their use in combat, control noise in large cities, optimize their resistance and avoid wear and tear. Globally, both the military and civil aviation sectors have begun manufacturing aircraft that generate fewer emissions, which has led to the use of new materials, alternative fuels and more efficient engines.

Research centers in Mexico specialize in new materials and Nano compounds:

- Mexican Corporation of Materials Research (COMIMSA)
- The Center for Research in Advanced Materials (CIMAV)
- Institute for Materials Research (IIM)

This creates chances to develop new materials and latest generation composite materials through their integration into international innovation networks in these areas.

Unmanned vehicles

Several companies in Mexico have focused on the manufacture and development of unmanned vehicles. An analysis of the trend towards UAVs shows that Mexico has the specialized manufacturing capabilities, research and development talent, and international Arrangements in dual use technologies required to become one of the market's main suppliers.

Knowledge Process Outsourcing (KPO)

KPO is a model for subcontracting non-substantial areas of large businesses, so that they can specialize in more strategic areas. This process is used in countries with dynamic economies and talent availability. In 2010, KPOs were valued at 17

billion dollars. India was the largest recipient, with 71% of the market share. The trend towards global KPOs is increasing. The value of the sector is expected to reach 34 billion dollars by 2020.

Mexico's competitive advantages make it a fortunate partner to receive KPO investment projects. It is the largest source of talent (engineers) in the Americas and is located next to the leading market for this type of service: the United States. Outstanding conditions to develop knowledge-intensive services are key to attracting KPO projects to the country, such as the A+D cluster in Baja California or companies like General Electric which have decided to specialize in this type of service due to their ability to capture projects that contribute a high added value to the global industry.

Maintenance, Repair and Overhaul (MRO)

MRO may be defined as, "All actions, which have the objective of retaining or restoring an item in or to a state in which it can perform its required function. The actions include the combination of all technical and corresponding administrative, managerial, and supervision actions."

The increase in the international air fleet requires an increase in the current installed capacity of MRO services. Like growth in capabilities, there is a trend to establish new MRO centers in strategic areas, especially those that have experienced higher growth in their fleets or are highly competitive due to available talent, their capacity to adopt advanced operation practices or their proximity to leading markets.

In 2010, the global civil MRO market was valued at 45.2 billion dollars. According to forecasts, this sector will continue to grow to reach 68.6 billion dollars by 2019.

Now days, the MRO sector is considered strategic for Mexico and arrangements are being made in order to create an integral aviation services hub for the Americas. Its importance lies in its ability to provide services for the narrow body fuselage market, be a pioneer in wide body fuselage services that are not available in Latin America, as well as engine maintenance. The whole vision of this hub includes projects such as mature fleet management (airplane recycling), aircraft overhauling and dismantling (supported by a training center) and specialized research and certification labs.

The Main Clusters in Mexico

State of Baja California

Geography

The state is bordered on the west by the Pacific Ocean, on the east by Sonora, the U.S. State of Arizona, and the Gulf of California (also known as the Sea of Cortez), and on the south by Baja California Sur. Its northern limit is the U.S. state of California.

Demography

The state has a population of 3,165,776 much more than the sparsely populated Baja California Sur to the south, and similar to San Diego County, California on its north. There is a large immigrant population from the United States due to its proximity to San Diego and the cheaper cost of living compared to San Diego.

Economy

Baja California's economy represents 3.3% of Mexico's gross domestic product or 21,996 million USD. The United States attracts two thirds of Baja California's exports. The rest goes to Canada, England, France and Germany, among other countries. It should be noted that exports to these countries have maintained steady growth since 2002.

Aerospace Industry

Baja California has more than 40 years of experience in aerospace. The state has the largest concentration of aerospace companies nationwide. This is due mainly to the supply chain proximity to California and Arizona and the availability of high quality labor force. The state also has a strong competitive advantage in terms of infrastructure (highways connecting the Mexican to the U.S. market, major cargo seaports, international airports, railway services and direct border crossing sites with six ports of entry to the U.S.)

There are more than 50 aerospace companies and support entities in Baja California, and it exports approximately 1.14 billion dollars, or 27% of national exports.

Baja California focuses its innovation capabilities on complete integration aircraft systems testing and interior design. In terms of manufacturing, the state specializes in precision machining, electrical and power systems, hydraulic systems and interiors and metal plate conformation processes. Some companies have internal capabilities for special processes, thermal and surface treatments. They also perform MRO activities on engine parts.

Baja California is becoming a pole that defines its capabilities transversally, which means it can capitalize its experience in the electronics, metal - working and

plastics and composite materials industries. This enables it to reinforce engineering activities related to development and support infrastructure for talent training and the supply of necessary technical and technological services, leveraging the global reach of its manufacturing industry's current operations.

Baja California's strategy focuses on knowledge process outsourcing services (KPO) for the A+D industry. In addition, the state has the potential to develop fuselage systems and power plants, which will make it an important manufacturing supplier with integrated value chains.

State of Chihuahua

Geography

It is located in Northwestern Mexico. It is bordered by the states of Sonora to the west, Sinaloa to the southwest, Durango to the south, and Coahuila to the east. To the north and northeast, it has a long line with the U.S.–Mexico border adjacent to the U.S. states of New Mexico and Texas.

Chihuahua is the largest state in Mexico by area, with a mainland area 95,543 sq. mi., it is slightly larger than the United Kingdom.

Demography

According to the census, the state population is 3,241,444 making the state the 11th most populated state in Mexico.

Economy

Chihuahua's economy represents 4.5% of Mexico's total gross domestic product or 29,826 million USD. Chihuahua's economy has a strong focus on export - oriented manufacturing.

Aerospace Industry

Chihuahua developed its strategy with the leading companies in the industry and the government.

There are currently more than 30 companies and support entities from this sector, of which four are original equipment manufacturers (OEM):

- Cessna, which manufactures electrical wiring systems for aircraft;
- Textron, which manufactures structures and cockpits for helicopters;
- Hawker Beechcraft, which manufactures metal components for the aerospace industry;
- Honeywell, which manufactures reaction engine components.

Chihuahua's exports are approximately 455 million dollars, that is, close to 11% of national exports from the sector. Chihuahua's exports are destined mainly for the United States, Germany, France and Canada.

There are 59 universities and technology schools, 65 technical schools and two high-level research and development (R&D) centers in Chihuahua, providing the talent required by the industry.

The state has the vocation required to manufacture fuselages and their parts, engines and their parts, harnesses and precision-machined products. Furthermore, the existence of both manufacturing and engineering companies and their installed Capabilities for the A+D niche are a great development and competitiveness opportunity for Chihuahua.

Chihuahua has 29,702 students of the more than 774,597 students enrolled in engineering and technology programs around the country. Of these, 3,253

graduate and 3,355 earn degrees every year, that is, 22% nationally, proving that Chihuahua is a state with high terminal efficiency.

Chihuahua's strategy is based on the maturity of the aerospace industry, which has enabled it to attract strategic projects from the leading companies in high technology dual and restricted use goods (particularly with its clear vocation for precision-machined products).

State of Sonora

Geography

Sonora is located in Northwest Mexico, bordered by the states of Chihuahua to the east, Baja California to the northwest and Sinaloa to the south. To the north, it shares the U.S.–Mexico border with the states of Arizona and New Mexico, and on the west has a significant share of the coastline of the Gulf of California.

Demography

With a population density of only 12 inhabitants per sq. kilometer, the state is home to 2,394,861 residents, 30% of which are concentrated in the capital city of Hermosillo, and another 15% in the Cajeme municipality. Other regions reporting high numbers of inhabitants are Nogales, San Luis Rio Colorado and Navojoa.

Economy

It has been economically important for its agriculture, livestock (especially beef) and mining since the colonial period. From the 20th century to the present, industry, tourism and agribusiness have dominated the economy, attracting migration from other parts of Mexico.

Aerospace Industry

Sonora is considered a state with integrated capabilities in aerospace machined goods, with casting, machining and secondary processes.

Sonora consolidates itself as a center of excellence in turbine blades and engine components. Sonora's aerospace capabilities began in electronics, particularly in connectors and harnesses. Today, Sonora is growing in terms of the complexity and technology of composite materials.

There are more than 40 aerospace companies and support entities in Sonora, and it exports close to 164 million dollars, mainly to the United States. In addition, Sonora has an important talent pool; it already has 25,939 students enrolled in engineering and technology programs.

State of Querétaro

Geography

The State of Querétaro is located in the heart of Mexico, just two hours away from Mexico City. It borders to the north and northwest with the State of San Luis Potosí; to the east with the State of Hidalgo; to the south, with the State of Michoacán and to the southwest, west and northwest with the State of Guanajuato.

Demography

The state has an approx. population of 1,800,000 and a population density of 137 inhabitants per square kilometer. Over the 20th century, from 1900 to 2012, the state's population has grown from 232,389 to the current figure. Growth rates were highest in the 1970s at over 4%, but since have come down to 1.9%. The capital city of Santiago de Querétaro has nearly half of the state's population.

One important factor in the population growth has been migration into the state from other parts of Mexico due to the state's industry, low crime rate and other factors. One recent phenomenon has been the influx of families from northern Border States migrating south to escape drug-related violence. An estimated 49 new families move into the state every 24 hours, on average.

Economy

Economic activity in the state is closely tied to trends at the national level. The city of Querétaro is by far the most important economic center in the state. Not only is Queretaro the population center of the state, it has high-quality soil for irrigation farming and cattle. It is directly connected by highway to Mexico City, the country's largest market, as well as the north of the country and the United States. This makes the city an almost obligatory stop for most people and goods traveling north and south. This geographical advantage has spurred industrial development in the state, especially since the 1970s. Another advantage the state has is its stable social and political situation. It has a low crime rate and also noted by a non-governmental organization "Transparencia Mexicana" as having the lowest levels of corruption among all of Mexico's states. However, overall, the state has one of the country's strongest economies.

Aerospace Industry

Querétaro is home to the prime aerospace cluster in Mexico and to the first and only National Aeronautical University and Aerospace Industrial Park inside an international airport. The aerospace cluster has flourished in Querétaro for five reasons: its privileged location, qualified workforce, quality of life, infrastructure, and its productive integration with more than 600 industries with foreign investment.

Querétaro has manufacturing, maintenance and overhaul, design and engineering capabilities. Companies such as GE, Bombardier, the Safran Group and Aeronova, among others, are established in the state. There are more than 30 aerospace companies and support entities in Querétaro, and it exports close to 668 million dollars, mainly to the United States and Canada.

Based on Querétaro's capacities, it has the potential to specialize in turbine design, manufacturing, assembly and MRO of complex fuselage parts, turbines and landing gears.

As an important coordination mechanism between the industry and higher education and research institutes, the Aerospace Research and Innovation Network of Querétaro (RIIAQ) contributes to developing and strengthening research, technological advancement and innovation capabilities.

Queretaro has the first education facility inside the cluster, UNAQ (Universidad Aeronautica de Queretaro) has the resources and expertise to assume some aspects of aerospace training including: aerodynamics, aircraft electro-mechanical systems, aircraft maintenance, aircraft structural integrity, avionics, industrial studies and common skills, jet aircraft propulsion technology, and procurement and systems.

Conclusion

The aerospace industry in Mexico is taking off. The industry now features over 200 firms, spread out over the main country's clusters, and employing more than 31,000 people. The pace of growth in recent years has been impressive considering the global economic slowdown.

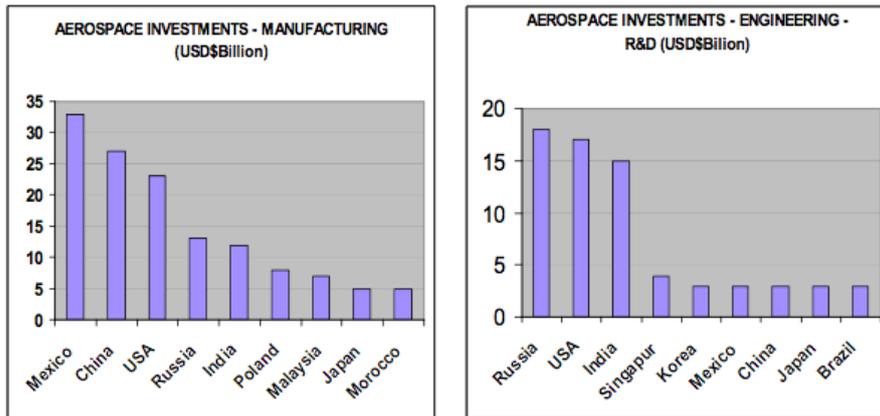
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Annexes

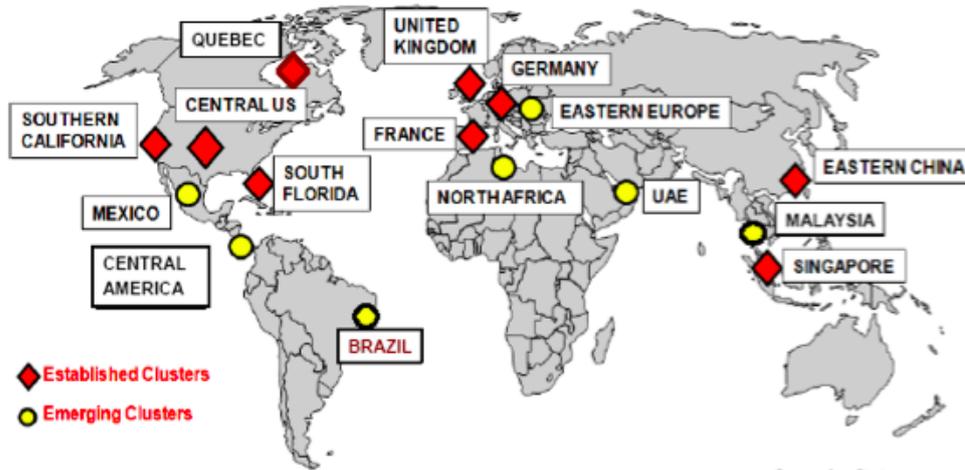


Annex 1 Aerospace Investment



Source: Management Consulting, "Aerospace Globalization 2.0: The Next Stage", September 2009

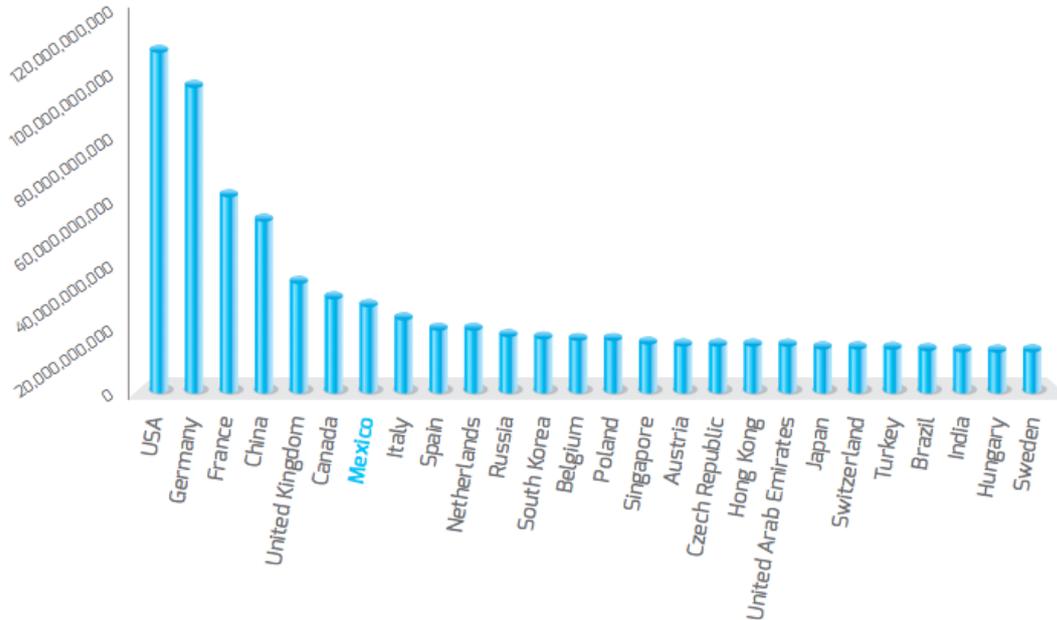
Annex 2 Global Clusters



Source: AeroStrategy

Source: Aerospace

Annex 3 Wassenaar Imports



Annex 4 Mexico Map Baja California, Chihuahua, Sonora and Queretaro



Annex 5 Mexico: Main Process in Aircraft Manufacturing

