Issue 2015/2016

THE AEROSPACE INDUSTRY IN GERMANY

MANUFACTURING AND R&D SOLUTIONS FOR THE AEROSPACE SECTOR

GERMANY'S HIGH-FLYING INDUSTRY

The German aerospace industry has enjoyed unprecedented success over the last two decades. Since the mid-90's, industry revenues have more than quadrupled - to over EUR 32 billion in 2014. During the same period, the sector has recorded annual average growth of more than seven percent. Employing a workforce of over 100 thousand (of which more than 50 percent are engineers or highly qualified professionals), the aerospace sector spent 13.3 percent of 2014 turnover (EUR 4.3 billion) on R&D – making it one of the country's most innovative industries.

ENORMOUS MARKET GROWTH

Industry analysts forecast that between 30 to 35 thousand new aircraft will be put into service in the next 20 years to meet increasing global aviation demand – leading to a new golden age of aviation. The main factors for the forecast market growth are rapidly growing passenger volumes and the increasing need to replace old and low-efficient aircraft.

INTERNATIONALIZATION AND NEW MARKETS

This substantial demand further opens up supply chains and sees a continued shift from regional to global sourcing. Internationalization helps to mitigate currency exchange risks, facilitates market access, and enables OEMs and suppliers to use competitive advantages. Germany, as a strong manufacturing base and home to major aircraft OEMs and suppliers, is at the center of the industry supply chain transformation process and offers multiple opportunities for international investors.

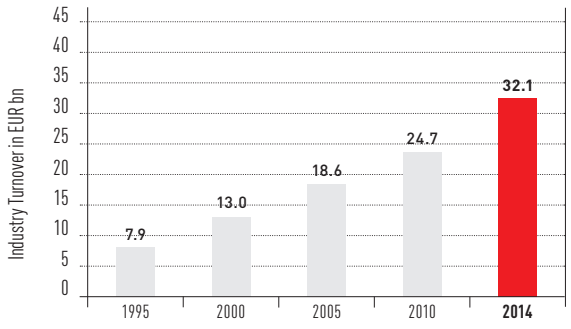
GLOBAL AVIATION MANUFACTURING LEADER

A global analysis of the attractiveness of aviation manufacturing conducted by PricewaterhouseCoopers reveals that Germany is the most attractive aviation manufacturing country, coming second only to the Netherlands. Compared with other major aviation manufacturing countries like the US, Canada and France, the country's combination of a powerful manufacturing base, ready availability of talent, and cost efficiency are unique competitive advantages for current and prospective investors. As well as being a major supply and manufacturing power, Germany is also home to the world's biggest freight and logistics carrier.

LEADING TECHNOLOGY FOR ECOLOGICAL FLYING

As a global aerospace hub, Germany is home to leading players from all civil and defense aviation market segments. Particular strengths are seen in energy efficiency-related technologies including the development and production of lightweight materials and engine efficiency optimization. Strong competencies in the field of energy efficiency are based on extensive R&D efforts and are also triggered by the country's "Energy Transition" project. This enables the country's industrial players to develop cutting-edge technologies that perfectly address the aerospace industry's trend towards "ecological air travel."

German Aerospace Industry Turnover



Source: BDLI 2015

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MARKET TRENDS

GROWING PASSENGER VOLUMES

Passenger aviation is an industry in demand. Over the next 20 years, forecasts predict demand for between 30 to 35 thousand new civil aircraft worldwide - worth more than USD 5 trillion. According to one major aircraft OEM, the greatest demand exists for single aisle airplanes (70 percent). Civil aviation is set to grow steadily, with aviation experts forecasting annual international airline traffic growth of around five percent. Current market developments are also being triggered by the need to replace large parts in airplanes still in service. Airplane operating costs are significantly affected by aircraft fuel consumption levels. Of the 30 to 35 thousand new aircraft forecast over the next two decades, around 15 thousand units will replace older and less efficient airplanes.

ECOLOGICAL FLYING

Alongside technological advances made in aircraft engine design, new materials and composites – as well as changes to overall aircraft design (e.g. retrofit with winglets) – are helping increase fuel efficiency levels through reduced weight and improved aerodynamics. Innovative aircraft interiors are also helping pave the way towards more ecological and comfortable modes of air travel. These and other measures all contribute to ambitious climate protection goals enshrined in Europe's "Flightpath 2050" aviation strategy. Europe's "Horizon 2020" research framework program also offers promising R&D support for the development of more sustainable, safer and integrated mobility solutions.

GLOBAL MARKETPLACE

Over the last two decades, the aerospace industry has undergone a significant shift from regional to global sourcing; a trend which is set to continue in the years ahead. The ongoing process of internationalization helps to mitigate currency exchange risks, facilitates market access and also enables OEMs and suppliers to use competitive advantages available in certain countries and world regions. Suppliers from more far-flung geographical regions have the chance to broaden their customer portfolio and reduce their customer dependency. At the same time, suppliers have the chance to increase their technological know-how by establishing contact to new industrial players and networks.

SUPPLY CHAIN TRANSFORMATION

Notwithstanding the fact that OEMs are also considering suppliers from other world regions, their traditional role as vertically integrated players is changing. In addition to their customer interface role, OEMs are increasingly focusing their attention on their function as system architects and integrators. Ongoing technological specialization leads to the outsourcing of systems – such as aviation electronics – and the design and production of aircraft structures. The increased importance of system and module suppliers means that OEMs require major suppliers to enter into risk-sharing partnerships with suppliers who are prepared to undertake technological and commercial risks. Globalization and outsourcing developments are also visible further upstream on the value chain.

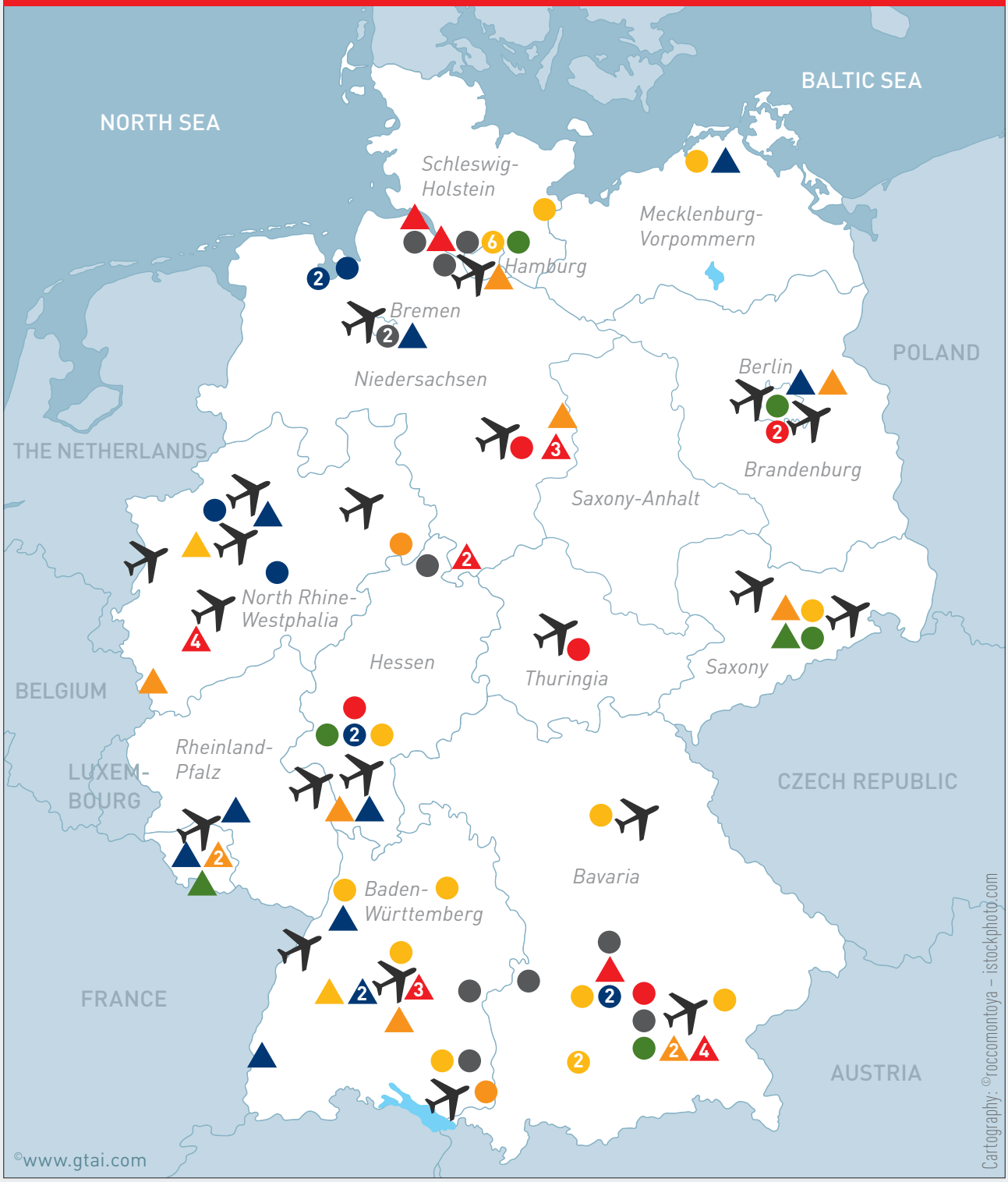
INDUSTRIE 4.0 AND CONNECTIVITY

From smart manufacturing ("INDUSTRIE 4.0") to the airline planning cycle revolution and the dawn of in-flight connectivity – the digital revolution is having a significant effect on the aerospace industry. IT solutions will penetrate all aspects of airline production and operation (including maintenance and engineering, ground, and in-flight operations). Real-time data enables quick reaction times to operational environment changes like weather conditions and airport traffic congestion. At the same time, ground operations can be accelerated, thereby increasing airplane utilization times. Growing passenger dependence on personal electronic devices may even allow airlines to replace costly and heavy in-flight entertainment systems with streamed content. Potential areas of application are numerous and provide an opportunity to further improve production, operational and maintenance efficiency, customer satisfaction, and safety.

Visit the Germany Trade & Invest INDUSTRIE 4.0 website for more information:

- **www.gtai.com/industrie4.0**

Aerospace Industry and Research Landscape in Germany



Aerospace Industry Production Sites with Focus on:*

- Engines
- OEM
- Interior
- Lightweight Construction & Materials
- MRO
- Chassis, Transmission

Reasearch and Development Institutions:*

- The German Aerospace Center (DLR)
- Max Planck Society
- Fraunhofer-Gesellschaft
- Leibniz Association
- Universities

* Symbols represent a selection of aerospace companies and research institutions by geographical location and number

Source: Germany Trade & Invest 2016

LOCATION ADVANTAGES

POWERFUL MANUFACTURING BASE

Germany hosts leading players from all business segments – from equipment manufacturers, material and component suppliers to engine producers and whole system integrators. The high concentration of aerospace-related manufacturing and assembly – as well as R&D, design, recycling and supply – facilities enables companies to successfully partner across the whole value chain. This environment offers numerous business opportunities across multiple technology segments for international investors. Particular location strengths are seen, for example, in the aircraft interior and aerospace energy-efficiency (including lightweight construction and new material development) segments. The in-situ workforce has also grown incrementally as a result of increased demand for German-made aerospace solutions.

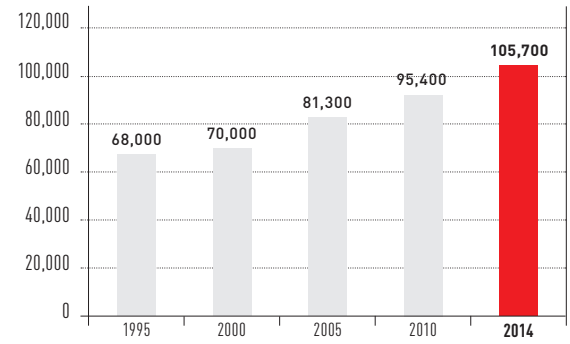
NETWORKS AND CLUSTERS

Industry stakeholders are organized in multiple regional aerospace clusters such as bavAIRia e.V., Hanse-Aerospace e.V. and Hessen Aviation. The country's particular strength in the development and manufacturing of lightweight solutions is also illustrated by the existence of specialized lightweight clusters. Lightweight clusters relevant for aerospace solutions are particularly related to carbon materials such as CFKValley Stade or Carbon Composites e.V., which again clusters multiple players within its regional branches (e.g. Carbon Composites East or Carbon Composites South-West).

WORLD CLASS AVIATION R&D LANDSCAPE

Companies active in the German aerospace industry invest heavily in R&D, with the industry recording one of the country's highest R&D spending levels relative to overall turnover. Strong industry investment levels are enabled and accompanied by the presence of an excellent public R&D landscape with dedicated government R&D support for aeronautics and space. The German Aerospace Center (DLR), Germany's central aerospace research body, employs approximately eight thousand people at 33 institutes across 16 locations. A number of institutes belonging to the renowned Fraunhofer-Gesellschaft, Max Planck Society and Leibniz Association also conduct aerospace-related research activities. Universities with highly specialized aviation programs and research institutions promote industry-specific innovation.

Number of Employees in German Aerospace Industry



Source: BDLI 2015

PUBLIC INCENTIVES AND R&D SUPPORT

Germany offers numerous incentives for all investors – regardless of country of provenance. There is a large selection of programs designed to support a wide variety of business activities at different stages of the investment process. These range from cash incentives for the reimbursement of direct investment costs to support for research and development and labor incentives. Thanks to its strong innovation dynamic, the aerospace industry is part of Germany's High-Tech-Strategy which is complemented by other government R&D support programs. Subject to the technology readiness level (TRL), the federal government makes two R&D support programs which provide public payments – either as a reimbursable advance or in the form of a non-refundable cash grant – available.

The *Luftfahrtforschungsprogramm* ("Aerospace Research Program") supports companies, research institutes and academics during the early technology development stage (TRL 1 to 6). This program provides non-refundable cash grants of around EUR 150 million each year. The *Luftfahrzeugausrüsterprogramm* ("Aerospace Equipment Program"), supports more advanced product and technology development (TRL 7 to 9) and incentivizes companies using reimbursable advances – repayment being subject to the success of the product ("deliveries") – of around EUR 600 million for the period up to 2019.

SETTING THE STAGE FOR SUCCESS

GLOBAL AVIATION MANUFACTURING LEADER

Germany is one of the world's most attractive aviation manufacturing locations. An analysis of the attractiveness of aviation manufacturing conducted by PricewaterhouseCoopers compared major aviation manufacturing countries in terms of cost ranking (taxes, manufacturing wages and energy prices), industry ranking (industry size) and talent ranking (engineering program matriculation and quality levels; productivity).

The overall ranking shows that Germany occupies a globally leading position compared to other major aviation manufacturing countries like the US, Canada and France. The country's combination of a powerful manufacturing base, ready availability of talent, and cost efficiency are unique competitive advantages for current and prospective investors.

Germany is a highly attractive foreign direct investment (FDI) location for companies in the aerospace sector. Within Europe, Germany is one of the most attractive FDI destination nations.

GERMANY TRADE & INVEST BEST PRACTICE: WEB INDUSTRIES INC.

Founded in 1969 in Marlborough, Massachusetts, Web Industries Inc. is a leading contract manufacturing provider of flexible material converting, process design, and material/supply chain management services to the aerospace sector. The company, looking to set up a production and processing facility, had initial exploratory talks with Germany Trade & Invest at a solar trade show. Contact to Germany Trade & Invest was re-established the following year at the successor event, with concrete interest in a "clean slitting room" investment project expressed in June 2011.

In November of the same year a meeting was set up with the investor and Germany Trade & Invest in Berlin, with a further follow-up meeting with the economic development agency of Lower Saxony. Having provided a range of services (including incentives and credit information, tax and legal services, and personnel recruitment support), Germany Trade & Invest successfully handed the project over to Lower Saxony in December of the same year.

Web Industries Inc.: Project Details	
Company	Web Industries Inc.
Country of Origin	USA
Industry	Precision converting and contract manufacturing
Company Objective	Production and processing facilities providing prepreg composite formatting in an EN9100C certified environment to support next-generation commercial aerospace development.
Investment Location Criteria	Clean room slitting operation with sales and distribution site and partners. Proximity of composite formatting operation to prepreg material production site resulting in increased manufacturing efficiencies and enhanced supply chain operations.
Selected Location	Stade, Lower Saxony
Investment Volume	EUR 10 million
GTAI Support	Incentives and low-interest loans information; personnel recruitment support; tax and legal advisory services
Initial Contact Established	2009
Project Handover	Lower Saxony economic development agency - December 2011
Company Formed	2011

Contact our industry specialists to explore the individual investment opportunities available to your business in Germany's thriving aerospace sector:

- **stefan.dibitonto@gtai.com**
- **rico.trost@gtai.com**

ABOUT US

Germany Trade & Invest is the foreign trade and inward investment agency of the Federal Republic of Germany. The organization advises and supports foreign companies planning to expand into the German market and assists German companies seeking to enter foreign markets.

INVESTMENT LOCATION GERMANY

Germany Trade & Invest provides close-to-market information to international companies looking to enter German markets. Our specialist industry teams prepare all of the relevant information essential to business success in Germany. Germany Trade & Invest's comprehensive range of information services includes:

- Market and industry reports
- Market entry analyses
- Business and tax law information
- Business and labor law information
- Funding and financing information

BUSINESS LOCATION SERVICES

Germany Trade & Invest supports international companies from market entry to business start-up in Germany. Expert project teams advise and assist in the business establishment phase. Germany Trade & Invest's range of services includes:

- Site location assistance
- Company formation information (legal)
- Tax information (national and international)
- Related key industry information

All investment-related services are provided entirely free of charge. Our specialist industry teams have hands-on experience in their respective industries and treat all investor enquiries with the utmost confidentiality.

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