

# Research and Innovation in the Aviation Sector

## Leverage in International Markets

RTI Strategy for the  
Austrian Aviation Sector  
2020 plus

Federal Ministry for Transport, Innovation and Technology  
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[www.bmvit.gv.at](http://www.bmvit.gv.at)



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# 1. Strategic framework

The strategic framework follows from the documented basic tenets with regard to research, development and innovation. Furthermore, the new strategy is mainly guided by economic circumstances and political conditions as obtained from numerous interviews, workshops, as well as communication with stakeholders.

## 1.1. European strategies

### Transport White Paper 2011

In their transport white paper "Roadmap to a Single European Transport Area", the European Commission developed a strategy for the improvement of mobility, the elimination of bottlenecks and the reduction of CO<sub>2</sub> emissions in transport until 2050.

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0144:FIN:DE:PDF>

### EU Aviation Package

The aviation package as planned by the European Commission in 2015 aims at strengthening the competitiveness of the EU aviation sector. The development of a European Aviation Strategy is one of the measures taken. In December, 2015, therefore, the European Commission adopted a new Aviation Strategy for Europe.

<http://ec.europa.eu/transport/modes/air/consultations/doc/2015-aviation-package/background.pdf>

### ACARE Flightpath 2050 – Europe's Vision for Aviation

In cooperation with ACARE (Advisory Council for Aviation Research and Innovation in Europe), the European Commission has formulated a strategy paper on research, technology and innovation within the European aviation sector until 2050. By way of an implementation plan for this vision, the Strategic Research and Innovation Agenda (SRIA), published in 2012, was developed by thematically-oriented working groups. In October 2015, ACARE commissioned an update to SRIA, scheduled to be completed by June 2017.

<http://www.acare4europe.com/sria/flightpath-2050-goals>

## 1.2. European research funding programmes

### Horizon 2020, Clean Sky II and SESAR

Horizon 2020 is the European Union's central framework in promoting research and innovation as defined for the period 2014–2020.

[http://ec.europa.eu/transport/themes/research/horizon2020\\_en.htm](http://ec.europa.eu/transport/themes/research/horizon2020_en.htm)

Clean Sky II is Europe's most extensive aeronautics programme, with a budget of more than €3.5 billion provided by the Horizon 2020 programme and the European aeronautics industry. It aims at strengthening the European aeronautics sector vis-a-vis international competition.

<http://www.cleansky.eu/content/homepage/about-clean-sky-2>

As part of the unification process of the European airspace, the SESAR (Single European Sky ATM Research) programme aims at sustainable development of the European aviation system. Its main goals are to triple this system's capacity, increase safety by a factor of 10, and improve environmental compliance by 10% per flight.

<http://www.sesarju.eu>

## 1.3. National policies

### Road Map Aviation

Road Map Aviation, the Austrian government's strategy for the aviation sector, aims at strengthening market competitiveness of the domestic aviation industry and establishing sustainable and efficient infrastructure.

<http://www.bmvit.gv.at/verkehr/luftfahrt/roadmap/index.html>

### RTI strategy „Becoming an innovation leader. Realising potentials, increasing dynamics, creating the future“

The strategy for Research, Technology and Innovation (RTI), published by the Austrian government in 2011, defines the strategic and operative goals in research, technological development and innovation in Austria until 2020.

[http://www.bmvit.gv.at/innovation/publikationen/fti\\_strategie.html](http://www.bmvit.gv.at/innovation/publikationen/fti_strategie.html)

The documents mentioned provide the strategic framework for the present strategy concerning the aviation sector.

## 2. Aviation – a dynamically growing area within a global economy

Strategically, the aviation sector is of immense importance worldwide, linking cities and continents and driving global economy. It is marked by intense research activity and an independence of trends and trade cycles.

### 2.1. Aviation as a power innovator

An average of 11% of the aviation sector's turnover is invested in research, technology and innovation. This quota makes civil aviation one of the most research-intensive industries worldwide, almost on a par with the pharmaceutical industry.

Research investment, however, is also remarkably efficient. Turnover generated from products newly introduced over the past five years roughly arrives at a 45% share of the company's total turnover. There is a great demand for new, innovative products that are capable of fulfilling the requirements of "less weight and noise, more fuel efficiency and comfort". Thus, together with pharmaceuticals, telecommunication and information technology, and electrical engineering and electronics, aviation ranks among the power innovators in industry and trade.

#### Share of turnover represented by R&I budget

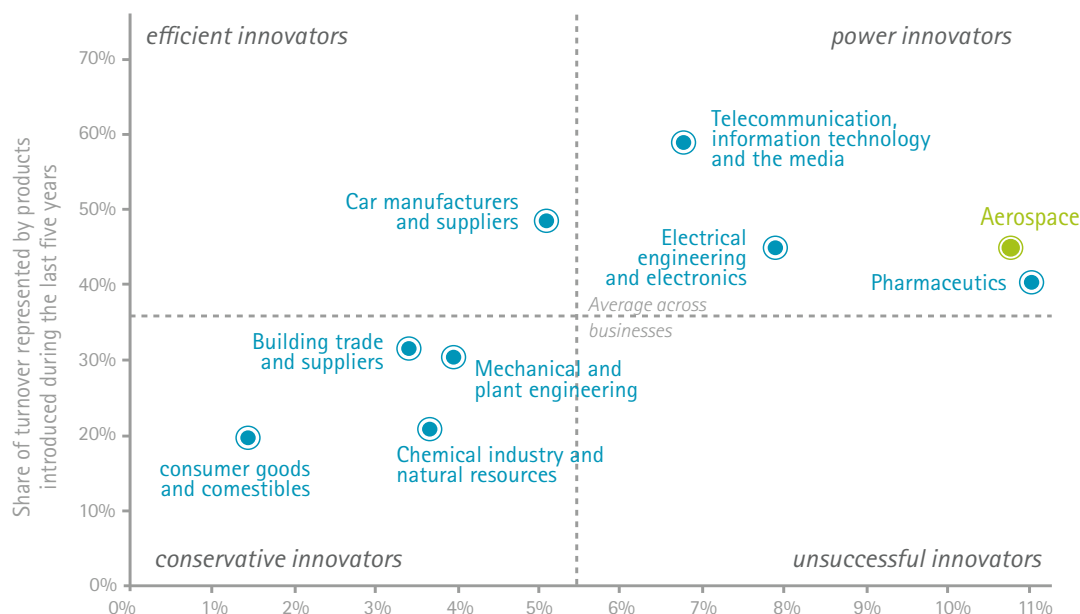


Figure 1: Share of turnover (newly introduced products) represented by RTI budget, source: Little 2004

## 2.2. Stability and immunity to cyclical trends

Aviation is one of the supporting pillars of value creation and employment. Long-standing independence of trends and trade cycles has shown the sector's resilience in times of crisis.

### Stability of commercial aviation

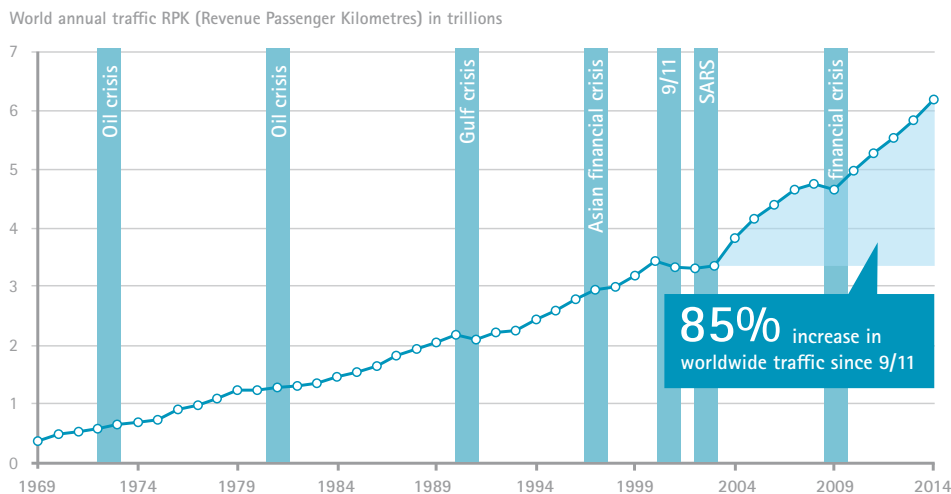
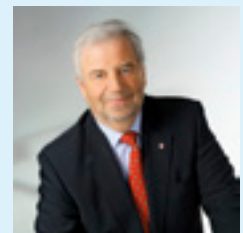


Figure 2: Stability of the commercial aviation sector, source: Airbus 2015

For decades, and in stark contrast to other lines of business, the commercial sector of aviation has proven to be largely independent of economic fluctuation and remarkably resilient against oil-related, financial and other crises.

Since 2003, the growth of worldwide air traffic has increased by 85%. This has contributed to the stability and crisis resistance of the domestic aviation industry as a growing business, and so has the increasing demand for mobility and strategic planning and implementation within the aviation sector itself. In view of aircraft's long life-cycles and the high amount of complexity involved in development, long-term partnerships are sought already at the research and development stage, ensuring long-term success.



Komm. Rat Ing. Franz Hrachowitz, General Secretary AAI

„As shown by the annual AAI statistics, the Austrian aeronautics sector has achieved an enormous growth since the 1980ies. No other EU country has accomplished such a rapid increase in turnover and employment in this sector, which has made Austria a “poster country” in this respect. This was facilitated by close cooperation within the Austrian sector and by systematically relying on public procurement, by Austrian Airlines as well as by public authorities, to pave the way. Furthermore, assistance, such as was provided by the AAI-initiated programme Take Off, has proved extremely helpful.”

### 3. The aviation sector in Austria: strength and diverse competencies

With a value of €365 billion, aeronautics generates around 2.4% of the EU's gross domestic product (GDP), representing 5.1 million jobs. European airports employ 12.3 million people and generate €675 billion of annual revenue. This corresponds to 4.1% of the European GDP.

In Austria, the entire aviation sector represents more than 40,000 employees (Steer Davis Gleeve 2014). The research-intensive area of aviation in Austria constitutes an important economic factor and includes all those agents presented in figure 3.

In particular, the aviation supply industry is looking back on a successful 25 years. Tripling of yearly turnover and doubling of employment are clear signs of its success.

#### Aviation in Austria

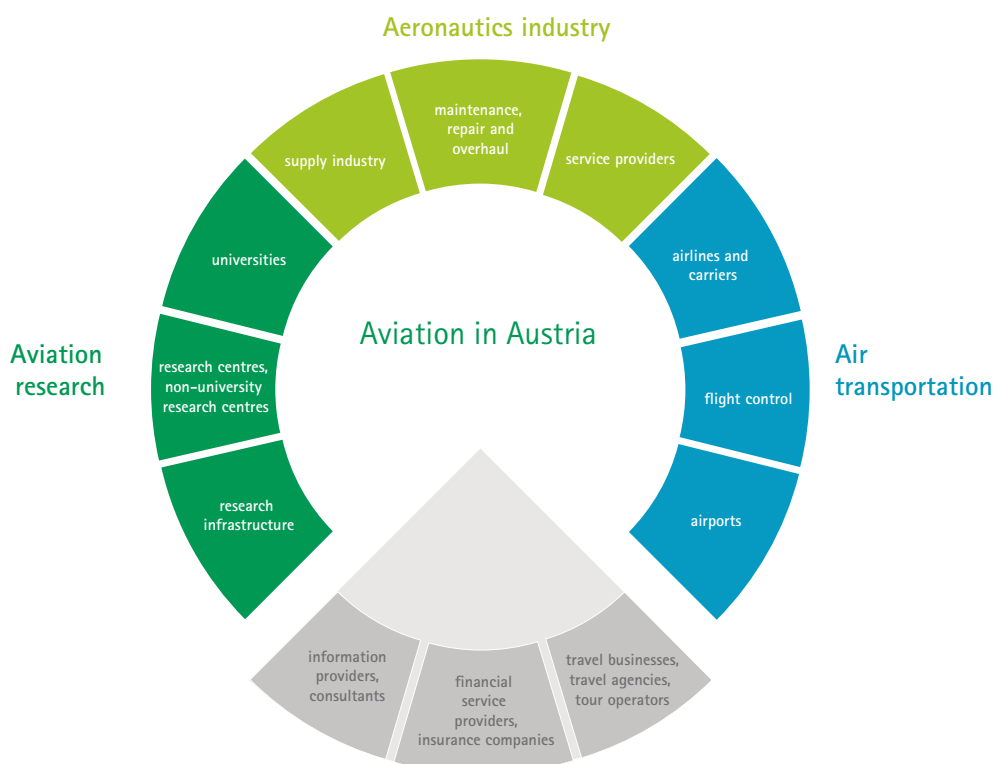


Figure 3: The Austrian aviation sector, source: AAI, Brimatech Services GmbH, own representation 2015

The RTI strategy for aviation is aimed at Austrian organisations active in the areas of aviation economy and industry, and at aviation-relevant research centres.



Mag. Johanna Egger-Berndorfer, CEO Brimatech Services GmbH

„In Austria, too, the aviation sector is of considerable economic importance. This includes airlines, civil airports, ground services, utility companies, traffic management, and manufacturers and suppliers. Remarkable results are arrived at when regarding the Austrian aeronautics industry and the carrier companies separately. In 2013, the Austrian aeronautics industry accounted for a turnover of €2.19 billion as well as 9,200 staff; airline carrier companies accounted for a turnover of €2.47 billion and 7,200 staff.“



### 3.1. Air transportation

In 2013, a total of around 26.3 million passengers were handled at six Austrian airports. Vienna Airport is the largest airport in Austria: 80% of the passengers and 96% of the volume of cargo are processed via Vienna. Compared to the rest of Europe, Austrian air traffic contributes only a minor part of the total volume. As can be seen in figure 4, Austria takes twelfth place in passenger volume, behind Belgium and Denmark. However, Austria's share increased from 2.9% (in 2009) to 3.1% in 2013.

Every five years, Austrian airports register a slight increase in passengers, with Innsbruck Airport contributing most to this trend.

Prognoses of future traffic volume clearly point upwards. Vienna Airport assumes a 5.2% increase in passenger volume per year. In Road Map Aviation 2020, the Austrian Ministry for Transport, Innovation and Technology (bmvit), in view of expected regulatory limitations, anticipates a 3% increase per year.

By 2030, this would have amounted to an additional 65% to then around 43 million passengers. This presupposes an appropriate increase in capacity and efficiency (e.g. a third runway).

#### Passenger volume compared to the EU

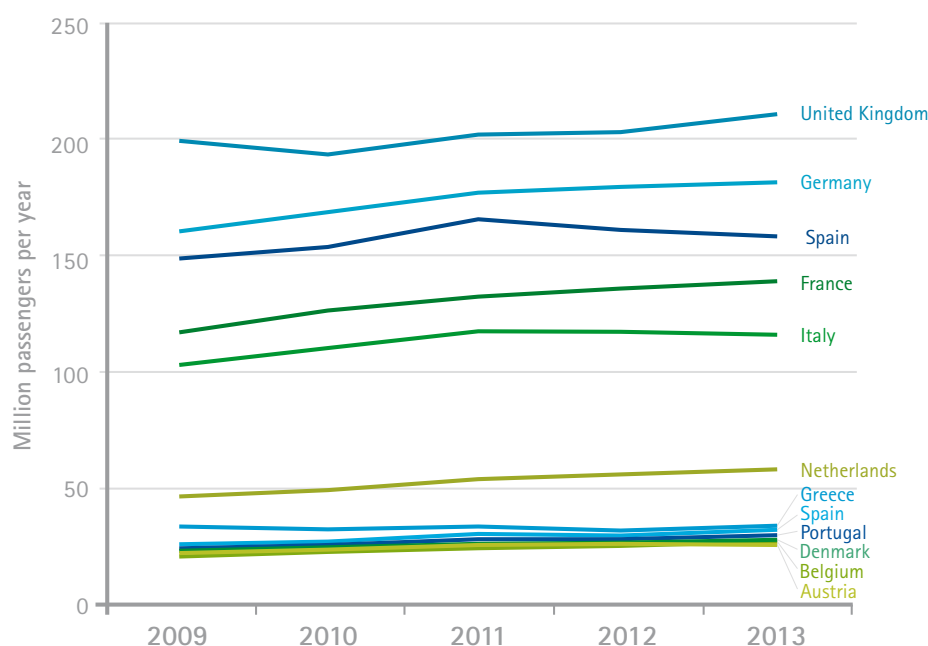


Figure 4: Passenger volume compared to the EU, source: Brimatech Services GmbH 2015



Mag. Walter Reimann, Head of Transportation Policy, Austrian Airlines  
 „Austrian Airlines alone, with more than 6,000 staff, has generated a turnover of €2 billion. With 47.7% of the passengers at Vienna Airport, Austrian Airlines held the largest market share in 2014, followed by NIKI with 11%.“

### 3.2. Aeronautics industry

Imbedded as it is in a rapidly growing global market, the Austrian aeronautics industry (that is, suppliers, maintenance, repair & overhaul, service providers) is a promising sector that has shown a dynamic development over the last decades. Since the end of the 1980ies, it has increased to about 225 enterprises – around 75% of it being SMEs. Recent surveys have calculated a total turnover of around €2.2 billion for the sector for 2013, which signifies an increase of around 40% against 2008. If the same 5-year interval is applied to businesses supported by Take Off, the increase is even higher (43%). Overall employment is around 9,200 staff, 13% of which work in research and development.

Small businesses have grown into medium-sized businesses, a fact that has led to a doubling of the latter in the aviation sector. Since 2009, 11 new enterprises have been involved in aviation (Brimatech Services GmbH 2015).

#### Aeronautics industry

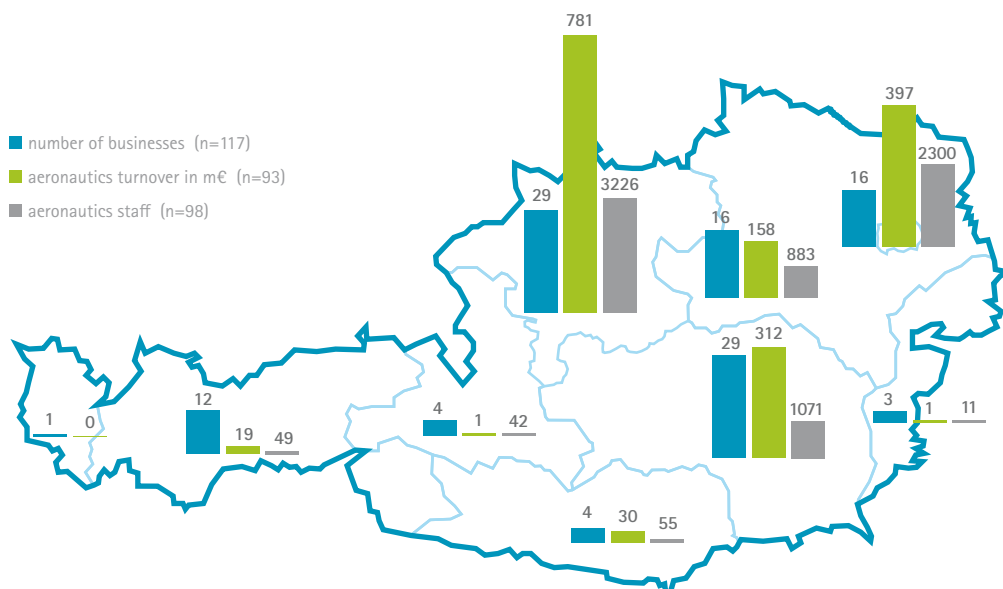
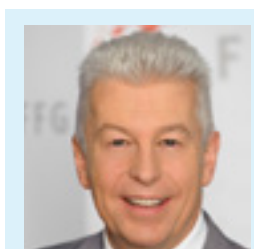


Figure 5: Competence map aeronautics industry (suppliers, maintenance, service), source: Brimatech Services GmbH 2015

As can be gleaned from the competence map above, the Austrian aeronautics industry is largely dominated by the provinces Upper Austria, Styria, Vienna and Lower Austria. In Upper Austria and Vienna, the greatest turnover is generated, while Styria and – again – Upper Austria are hosts to most production businesses and service providers.

To a large extent, Austria's aeronautics industry is export-oriented, with an average export quota of around 72% – an increase by two thirds vis-à-vis 2009. The greatest market is Europe (57%), followed by North America (31%). One in five businesses is mainly orientated towards the Austrian market.



© Petra Spiola  
Klaus Pseiner, CEO Austrian Research Promotion Agency FFG

„The vitality of the aviation sector is a true success story: Austria has managed to establish a compact and effective network and has prevailed over powerful competition in a highly competitive field. This clearly demonstrates the vigour of the Austrian industry.“

### 3.3. Research, technology and innovation

In Austria, there are around 40 university and non-university research institutes plus applied science universities competent in research, technology and innovation as it pertains to aviation. This range is further extended by research infrastructure such as the Vienna Climatic Wind Tunnel (RTA) or the Lake Side Labs.

Nationally promoted research, technology and innovation in the area of aviation has seen a remarkable upsurge over the last decade, to which the funding technology and innovation programme Take Off, initiated by the bmvit and managed by the FFG, has contributed greatly. Government research aid of €1 million facilitated an extra production of €5.1 million. Compared to Germany – factor 4 – the effects are more favourable in Austria. Since 2002, aviation projects have been funded with a total volume of €350 million in public funds and private investments.

The Austrian research sector is well established within its European context as well. Between the sixth and seventh framework programme, the compensation rate of grants rose by 18%, as can be seen in table 1. A further uptrend is to be pursued within the Horizon 2020 programme.

EU framework programme	Total applied (€)	Total applied, AT (€)	%	Recovery rate (%) to AT
Total aviation FP7	1.293.289.169	17.755.338	1,37	68,6
Aviation AAT	1.092.336.010	12.529.865	1,15	57,4
Clean Sky	200.953.159	5.225.473	2,60	130,0
Total aviation FP6	950.332.839	10.522.956	1,11	50,3

Table 1: Recovery rates from European RTI programmes, source: FFG Database 2015

### Product and research areas in aviation in Austria

The range of products and services by the Austrian aviation industry is wide and divers. Around 225 businesses and companies show competencies in 9 market segments. Figure 9 illustrates the distribution of funding granted by Take Off over these 9 segments in the past decade.

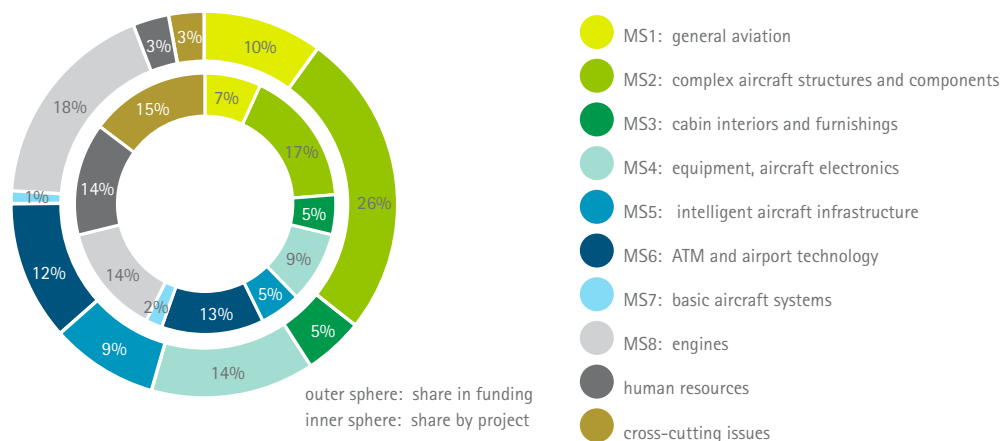


Figure 6: Distribution of Take Off budget among Austrian market segments, source: FFG Database, Analyses by KMU Forschung 2015.

## 4. Aircraft components made in Austria

### New materials and production technology

This is the market segment that covers 43% of businesses in the Austrian aeronautics industry. New and improved materials, material alloys and coating technology are ever in great demand. Innovative ideas on intelligent tooling, intelligent production and highly automated assembly are essential in optimising cost efficiency.

### Aircraft

This market segment (11% of all businesses) concentrates on innovative developments regarding aircraft as such as well as on realizing new potential areas of application. This predominantly concerns single- and multi-engine light aircraft, sporting and business aircraft as well as unmanned aerial vehicles (UAVs). With regard to passenger and cargo aircraft, the focus is predominantly on system integration, which is also being addressed by other market segments.



### Air traffic infrastructure and air traffic control applications

The growing demand for mobility, the increase in scheduled air transport and the expanding number of flight routes within the EU requires an efficient and intelligent infrastructure in the air as well as on ground. In this sector, which includes 15% of all businesses, research is centred on optimised vehicles and other equipment to be employed on the airfield, new light and wayfinding systems, fuel loading and de-icing systems, power supply, communication, location, information systems and system monitoring as well as new methods of dealing with weather conditions. This segment is the most employment-intensive in the Austrian aeronautics supply industry.

*„It was a great responsibility and challenge to create – and build – a generic aircraft model in CAD that mirrors the productivity of the Austrian aeronautics industry and its suppliers. Unlike with other models, the particular challenge lay in the implementation of the many aircraft components, since we basically needed to construct a wide-body aircraft with all its systems, characterised by an innovative design. But, after more than 1,000 hours of construction work and countless attempts at 3D printing with a variety of methods, the model is something to be proud of. Personally, I feel it was the most exciting generic wide-body project that I have ever worked on.“*

DI (FH) David-Alexander Bausek, FH Joanneum and Design Engineering Manager at Diamond Aircraft GmbH





## Complex aircraft structures and components

This segment is among Austria's dominant segments, in which 40% of all businesses are involved. This market segment aims at optimizing construction elements, components, subsystems and systems for application in the airframe's primary structures. This includes fuselage, wings, empennage, engine hoisting and landing gear. Structure technology has considerable potential for generating an increase in efficiency.

## Cabin interiors and furnishings (incl. cargo hold)

This is another strong segment, also including 40% of businesses, which work on innovative solutions for on-board information and entertainment. The focus here is on innovations that facilitate a comfortable and barrier-free voyage. Another aim lies in integrating entirely new and modern design elements.

### Systems

In this segment (which involves 19% of businesses), research topics range from optimizing hydraulics and pneumatics to air conditioning and ventilation to de-icing and rain protection systems. The development of improved ground-based flight control of UAS also falls into this category.

Figure 7: Aircraft components made in Austria, source: Brimatech Services GmbH, FH Joanneum, bmvit

## Air traffic infrastructure, ground test equipment, training devices

This segment, which includes 11% of businesses, focusses on the development and production of test facilities, ground test equipment as well as training devices and flight simulators. Research is conducted on enhancing their cost efficiency in maintenance, repair and overhaul, with particular emphasis on increasing the service life and reusability of components, on the feasibility of self/assessment, and on advanced diagnosis with non-destructive testing.

## Engines

Another strong position (with 32% of businesses) is held by the engine segment, which has the second-highest number of aviation staff. This segment is specifically oriented towards new or improved propulsion systems and alternative fuels. Research topics here include, among others, increasing thermal as well as propulsion efficiency, or optimising the airflow in high- and low-pressure turbines. The novel aircraft engines that are scheduled to be on the market by 2020 will decrease aircraft emissions by 10 to 15%. From 2025/2030, emissions are expected to be lowered by as much as 40%.

## 5. Global trends in aviation

National strategies in research, technology and innovation must confront global trends, which can be challenging but also offer chances and potential for future development. The following factors may be identified:

### 5.1. Growing markets

Global economic growth opens up new markets. Nowadays, emerging economies grow faster than the leading industrial nations. In those dynamic hubs of growth – such as Asia – increasingly well-to-do middle classes are developing. In combination with the low-cost model many carriers employ, this fact leads to a world-wide increase in the significance of tourism and hence also in the demand for mobility.

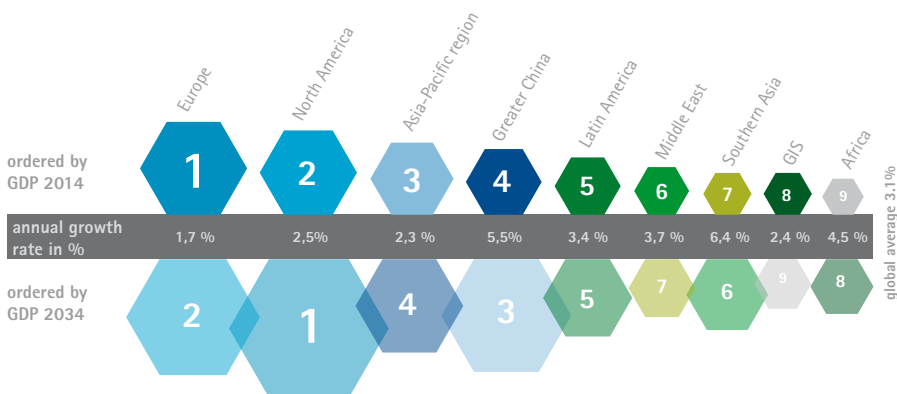


Figure 8: Global GDP growth rates, source: Bombardier 2015

### 5.2. Striving to reduce oil dependence

Due to rising crude oil prices, airlines are subjected to a high – and increasing – cost pressure. According to Boeing, the share of fuel costs in the total operation costs of airlines has roughly doubled between 2003 and 2013. In the case of wide-bodied aircraft, fuel costs already amount to ca. 50% of total operation costs. As all long-term forecasts expect a further rise in oil prices, one important principle of strategic initiatives (nationally as well as on a European level) is reducing oil dependence.

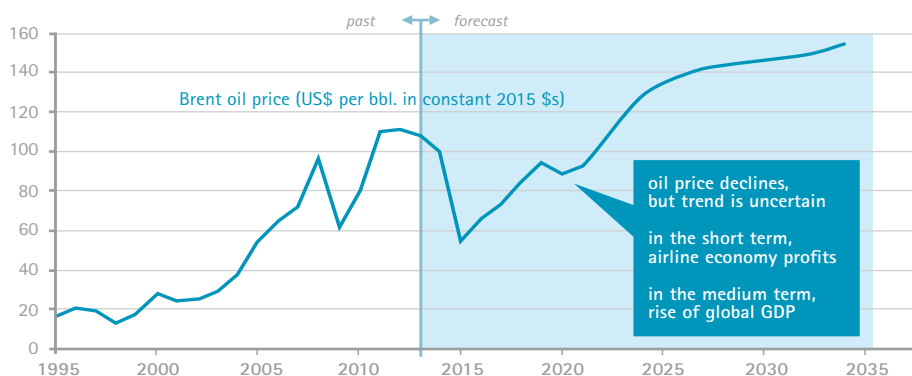


Figure 9: Long-term oil price forecast, source: Airbus 2015

### 5.3. Growing environmental awareness

Growing environmental awareness leads to stricter political constraints and tighter rules. European and international policy papers define clear climate protection targets. Thus, for instance, the IATA, in order to reduce polluting emissions, requests that the aviation sector increases its fuel efficiency by 1.5% a year; it further demands carbon-neutral traffic growth from 2020 as well as a 50% reduction of polluting emissions by 2050. Manufacturers predict that by 2034, two thirds of the aircraft fleet will have been replaced with eco-efficient aircraft (Bombardier 2015).

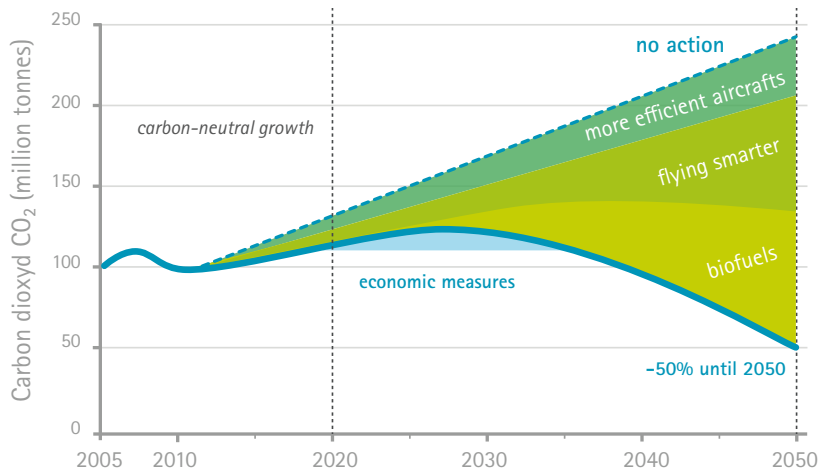


Figure 10: Emissions reduction road map, source: IATA Annual Review 2013

### 5.4. Rapid urbanisation

In 2030, around 60% of the world's population will live in cities; by 2050, this will have increased to around 70%. This global, progressive process of urban concentration also leads to a concentration of long-haul air traffic in aviation mega cities, which are defined as urban agglomeration with more than 11,000 long-haul passengers a day. A study by Airbus predicts that, over the next 15 years, the number of such global centres will have more than doubled (from 41 to 91). Vienna will be one of them and, given sufficient capacity (e.g. a third runway), might function as an important hub.

#### 2034 Aviation mega cities

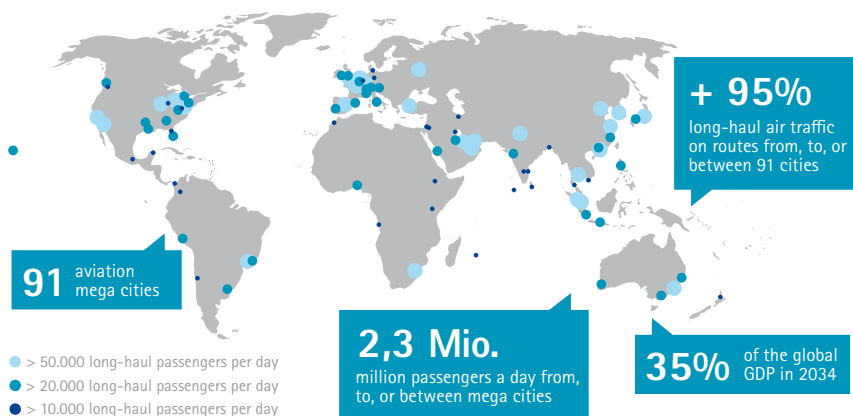


Figure 11: 2034 Aviation mega cities, source: Airbus Group 2015.

## 5.5. Three great challenges for aviation in Austria

From these global trends, three challenges can be derived, which are to be met by the RTI aviation strategy.

### Challenge #1: Rising demand for aviation services and aircraft

In their forecasts, international manufacturers, such as Airbus, Boeing or Embraer, assume an average global growth rate of around 5% per year. This continues the growth trend of the last 20 years. For Europe, forecasts expect around 4% a year.

#### Development of global passenger volume

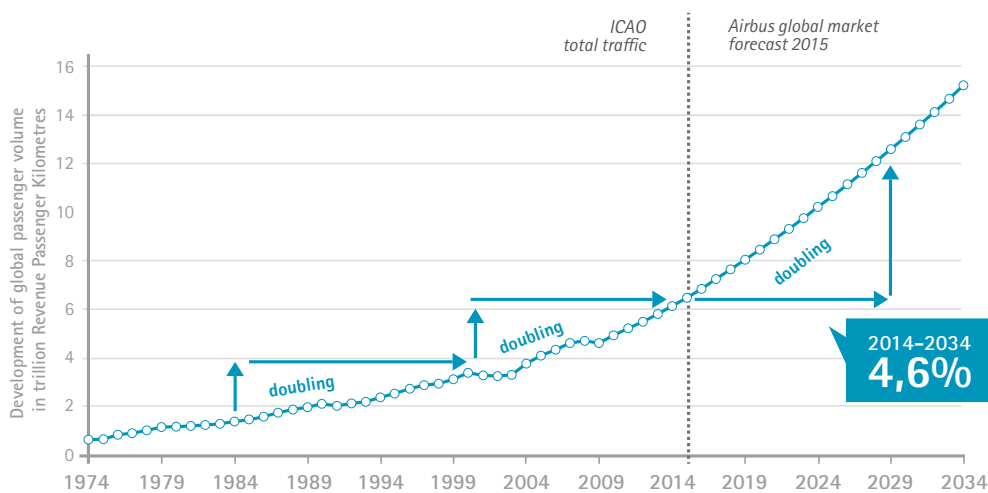


Figure 12: Rising passenger volume, source: Airbus Group 2015

#### Development of global freight volume

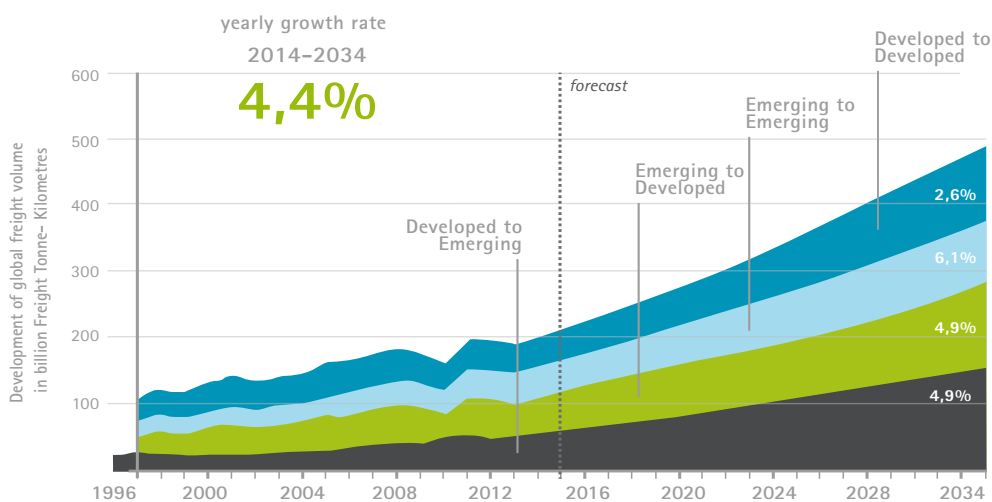
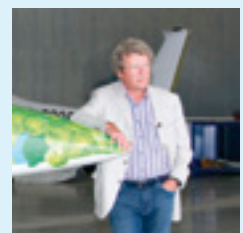


Figure 13: Rising freight volume, source: Airbus Group 2015



Christian Dries, CEO  
Diamond Aircraft  
Industries GmbH

„Asia, Latin America, the Middle East and Africa are interesting growth markets. Long-term fleet growth is foreseeable. Also in the air screw segment, sales shares could be raised. In the long term, an increase in aircraft operations is to be expected in these markets.“

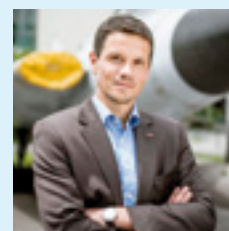


Sectors	Number of aircraft required
Commercial aircraft (until 2034)	<p><b>Boeing:</b> around 38,000 new aircraft. This amounts to a doubling of the numbers vis-a-vis 2013 and induces a market volume of around US\$ 5.6 trillion (Boeing 2015).</p> <p><b>Airbus:</b> around 32,600 passenger aircraft with more than 100 seats and cargo aircraft with more than 10 tons of net load until 2034. This induces a market volume of around US\$ 4.9 trillion. Around 80% of these will be new aircraft (Airbus Group 2015).</p> <p><b>Bombardier:</b> around 5,700 aircraft of 60 to 100 seats, 7,000 aircraft of 100 to 150 seats (Bombardier 2015).</p>
Helicopters (2014-2018)	In the helicopter segment, the most attractive markets are North America (26% market share), Latin America (24%) and Europe (23%).
Small aircraft (2013 - 2034)	The expected growth from around 210,000 to 225,700 aircraft promises a continued moderate rise of 0.5%.
Unmanned aerial vehicles	Worldwide, procurement volumes of US\$6.4 billion (2014) will be increased by almost 80% to about US\$11.5 billion over the next ten years, which correlates to every seventh Euro. In total, the USA are to cover 40% of the procurement volume and 65% of research expenditure (AUVSI 2013). Europe expects 150,000 new jobs in Europe until 2050 (EC 2014).



Prof. Dr.-Ing. Michael Weigand, Head of Department TU Wien (Vienna University of Technology):

"In 2014, a dominant role was played by the European rotorcraft sector, with a sales share of 50% on the global market (civil sector only). For the period from 2014 to 2018, helicopter manufacturers expect delivery of 4,800-5,500 new turbine-powered helicopters for the civil market (Honeywell forecast, 2014)."



FH-Prof. Dr. Holger Flühr, Head of Department FH Joanneum (Univ. of Applied Sciences, Joanneum):

"Provided necessary standards and rules are introduced and certification procedures are harmonized, a tenfold increase of civil UAVs in Europe until 2017 can be expected."

Table 2: Aircraft required

## Challenge #2: Decoupling emissions

Strict environmental targets in European and international policy papers demand that traffic be decoupled from fuel consumption and polluting emissions.

### Flightpath 2050

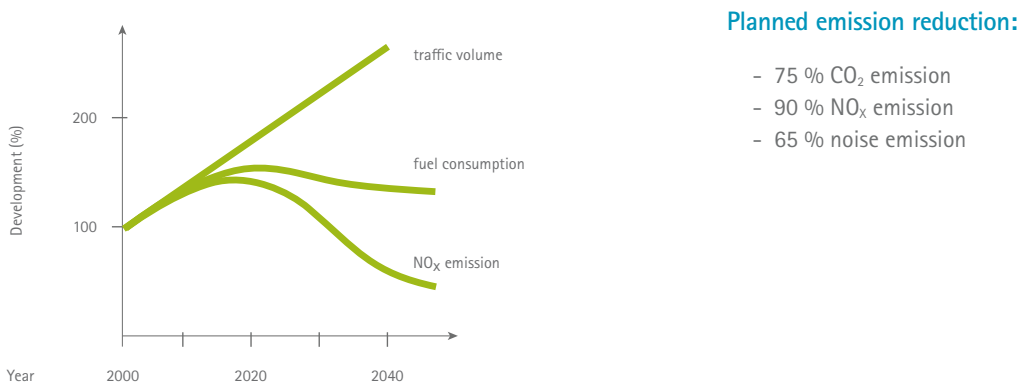


Figure 14: Emission reduction development, source: Flightpath 2050

While the 2001 white paper still mentioned decoupling economic growth and growth in traffic volume, the 2011 white paper aims at decoupling the latter and the negative effects of traffic. The same ideal is also followed by the ACARE Flightpath 2050 policy paper, which sets challenging goals. Among these is the planned reduction of emissions, such as decreasing CO<sub>2</sub> emissions by 75% and NO<sub>x</sub> pollutants by as much as 90%. Moreover, it aims at reducing noise emission by 65%. Intelligent and environmentally friendly flight procedures as well as alternative fuels are to contribute to this. In accordance with the ideal of more efficient aircraft, it is especially technological innovation (e.g. in structures, materials, but also engines) that could facilitate such reductions.

Innovative technology	Savings	Period
Engine technology	40 % energy	1960 – 2010
Structure and engine technology	70 % efficiency 70 % CO <sub>2</sub>	1960 – 2010
Fibre-reinforced composites (CFRP)	40 % weight	2000 – 2010
Innovative procedures		
Shorter flight times	100kg CO <sub>2</sub> /minute	

Table 3: Actual savings due to innovative technological development, source: IATA 2013

### Challenge #3: Niche new markets, develop existing markets

Increasing globalisation and the economic development in threshold countries offer access to areas barely tapped so far. Promising new perspectives also arise in extra-European and non-American growth markets, such as China and Russia.

#### Development according to traffic volume

Middle-term forecasts for global traffic volume predict a massive increase in the Asia-Pacific region. By 2034, more than a third of air traffic flow (measured in revenue passenger kilometres) will lead there. Thus, Europe's share will decrease from 25% today to 21% in 2034; that of North America will drop from 25% to 17%. A distinct increase, on the other hand, is predicted for the Near East and Latin America. In 2034, therefore, 36% of air traffic will go to the Asia-Pacific region, 21% will remain inside Europe and 17% will go to North America.

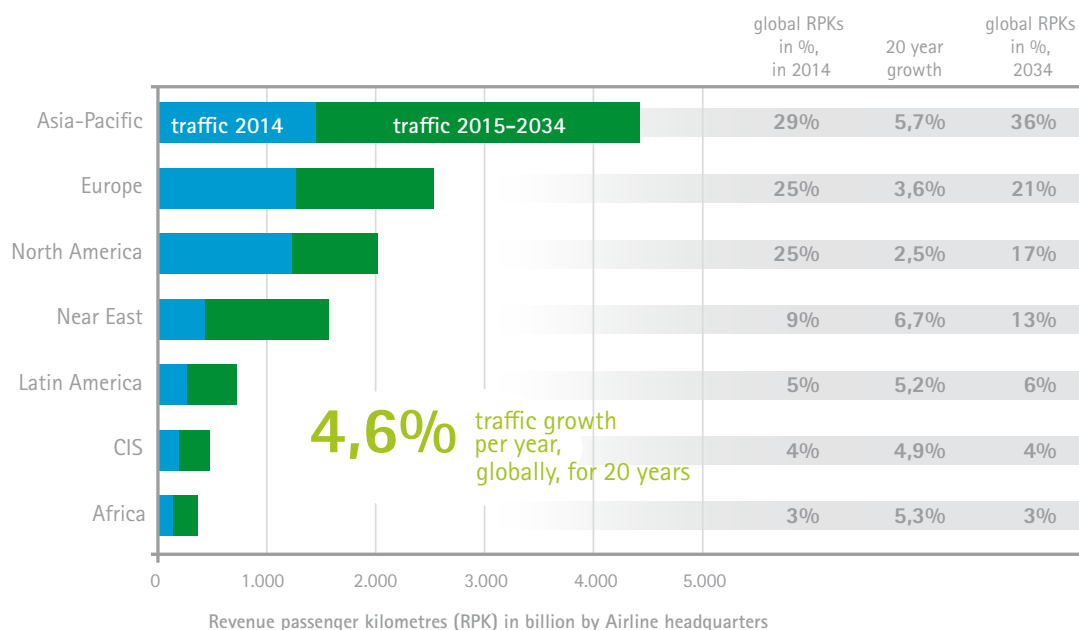


Figure 15: Development of traffic volume by market (revenue passenger kilometres), source: Airbus Group, 2015

According to a prognosis referring to the next 20 years, increase in traffic volume is estimated at 4.6% a year, globally. At country level, the strongest growth rates in traffic flow until 2034 are expected in China (plus 7%), in India (plus 9.8%) and in the Middle East (plus 8%).

Furthermore, instrument flying to the Asia-Pacific region will increase by at least 5.7% per year until 2034. Similarly, growth rates between 5 and 7% are predicted for flights to Eastern Europe, into the Middle East, and to Africa. Comparatively the lowest rate is expected for flights to America. In all fast-growing regions worldwide, modernising air traffic management (ATM), and thus implementing innovative technologies and processes, is as crucial as it is in the USA or Europe (Airbus Group 2015).

## Development by demand and topics of the future

### Commercial aircraft

The following map offers an overview of how manufacturers appraise the development of the market situation of a variety of product sectors in different parts of the world.

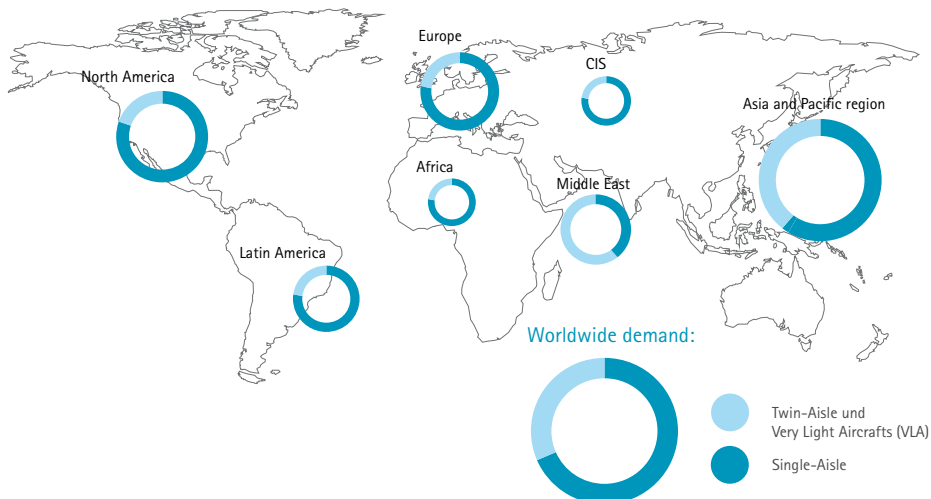


Figure 16: Demand for commercial aircraft, source: Airbus Group 2013

When considering commercial passenger and cargo aircraft in the Single Aisle, Twin Aisle and VLA (Very Light Aircraft) categories, an equally strong demand can be determined. The majority is to be found in the Asia-Pacific region (36%), followed by Europe and North America (20% of the total).

### Unmanned aerial vehicles and systems

In the USA, sales quantity of civil UAS is expected to quadruple. While, in 2015, already 38,000 UAS are to be sold, the Association for Unmanned Vehicles International (AUVSI) estimates that in 2025, the number will have risen to 160,000 in the commercial sector. At least 80% of these are to be used in agriculture, just under 10% in public security and a further 10% in various other fields, such as the observation of industrial plants or in the area of film and photography.

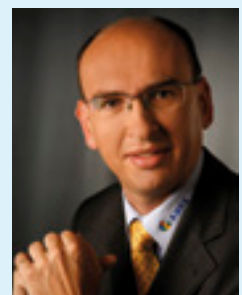
### Topics of the future and technological niches

The global demand for technology offer possibilities for the domestic aviation industry to occupy strategic niches. Furthermore, aviation stakeholders in the field of RTI, especially traffic service operators, have identified a demand for an extended SME-based supply chain to national airlines. In concrete terms, the market offers possibilities for maintenance, repair and overhaul (MRO) businesses. Moreover, long-term perspectives with regard to extra-European and non-American growth and sales markets, such as China and Russia, are perceived. Certain activities are currently being undertaken and are intended to be expanded and sustained. Additionally, a growth of 12% per year has been predicted for the CFRP market. Materials are considered the strongest Austrian market niche.



Prof. Dr. Carl-Herbert Rokitansky, Head of the Aerospace Research University, Salzburg

„By using advanced flight planning software, optimized 4D-trajectories will be employed in the future, as a basic concept of SESAR. These, too, will contribute significantly to reducing costs and controlling pollution. In addition to this, developing, testing and using artificial-intelligence-based decision support tools for flight controllers and pilots will help to optimise the processes and procedures in air traffic management (ATM).“



Walter Starzacher, CEO AMES

„The international market serving the conversion of commercial passenger aircraft shows great promise with regard to growth prospects (which, at 8% per year, are considerable).“



## 6. Strategic requirements

The strategic framework is derived from overarching strategies, requirements of the Austrian aviation stakeholders and global trends. Collectively, they are addressing the following three dimensions: economy – environment – society.

### 1

#### Securing the competitiveness of a centre of innovation

Globalization and economic growth influence the aviation sector. A national economy that is more successful at increasing the leverage from knowledge than others is at an advantage. Against this background, countries spearheading research, technology and innovation have a decisive and sustainable competitive edge.

### 2

#### Effecting pollution control and protection of the environment

Innovations and developments in technology contribute fundamentally to reaching climate protection targets and reducing pollution emissions. The focus here is on developments in aerodynamics, lightweight construction or innovative materials as well as on the development of engine components and alternative fuels. Further important points are innovative procedures and processes (such as noise-reducing approach procedures).

### 3

#### Innovation to improve the aviation system as a whole

First and foremost, any aviation system must observe the needs of its users while keeping socio-political aims and a sustainable economy in mind. At the same time, however, the system's performance must be guaranteed. These matters must be taken into consideration in all relevant projects.



*Dr. Christian Helmenstein,  
Chief Economist of the  
Federation of Austrian  
Industries*

*„The central element of strategic niching, as well as the establishment and extension of leadership in technology, is technological, organisational and social innovation within the areas of strength of the Austrian aviation sector. With it, Austrian industries and businesses are well equipped to partake of the enormous potential of global aeronautics.“*



*Mag. Alexander Hanslik,  
Head of Austrocontrol  
Research*

*„Air traffic is of immense importance for Austria as a business and industry location. In this, aviation, and particularly flight control, is a very research-intensive sector. It is therefore crucial to consciously and purposefully support research and innovation in this area, thereby continuing to rigorously develop the aviation system with regard to customer needs, security, and ecological sustainability.“*

## 7. The three targets for the aviation sector 2020 plus

The bmvit and the industries and businesses involved in the Austrian aviation sector have set themselves three ambitious targets:

# 1

**In 2030, 15,000 staff will generate a turnover of €4 billion in the Austrian aeronautics industry.**

Within the probability range of a scenario analysis, this goal is positioned as a challenging but realistic vision the stakeholders could agree upon. The turnover of Austrian manufacturers and suppliers grows at 4% a year in real terms, proportionally to global market growth. Therefore, the turnover of the Austrian supplier industry will have increased by €2 billion by 2030, which amounts to a doubling vis-a-vis 2012. Employment growth corresponds to global growth forecasts for leading manufacturers and reaches 2.5% a year. This amounts to a rise of around 60% until 2030. In 2030, the number of Austrian aeronautic staff will be higher by 6,000 than it was in 2012.

# 2

**In 2030, the domestic aviation sector will generate a compensation rate of around 80% from European research initiatives to Austria.**

With their promotion strategies and programmes in aeronautics, European research initiatives (such as Horizon 2020, JTI Clean Sky II, SESAR) very much cater for the needs of Europe as a whole. The specific needs of a small country like Austria, as well as relevant topics of research, are frequently underrepresented. With a compensation rate of currently under 70%, the contribution of Austrian businesses is fairly low. Intensifying committee activities of national companies and businesses on a European level is intended to reinforce the position of the national aviation sector, aiming at a compensation increase to 80%.

# 3

**In 2030, innovative solutions will contribute significantly to the performance of the Austrian air transportation system.**

It is becoming progressively more evident that the dominant bottle necks of capacity are to be found on the ground. Commonly, no appropriate expansion capabilities are available. Therefore, innovative solutions are needed to facilitate a better use of existing resources in order to prevent potential capacity bottle necks at airports and their interfaces. Within the framework of the integrated inspection of the system as a whole, the competitiveness of the Austrian aviation sector is to be strengthened through innovation.



DI Rudolf Gradinger,  
Light Metal Technologies  
Ranshofen, AIT

*„It is by closer collaboration of relevant contributors that an adequate positioning of national interests on a European level is to be sought. Increasing the compensation rate from European programmes related to aviation – especially Horizon 2020 – by up to 10% is a clear goal.“*



## Action plan: three targets – four bundles of measures

The action plan converts strategic goals into actual suggestions for measures to be taken. These latter were jointly devised with stakeholders from public administration, research, industry and economy in the course of a participative process in the bmvit.

The action plan contains four bundles of measures which should enable Austrian aeronautic companies and businesses to jointly meet the three strategic targets; participants are organisations in aviation research, the aviation industry and air transport economics. Within these bundles of measures, the following activities are proposed:

### The four bundles of measures

<b>1</b> Expanding competencies in RTI, better coordination, and use of promotion instruments	<b>Location:</b> Technological, organisational and social innovation reinforce competitiveness <b>Environment:</b> Innovations help in reaching environmental targets <b>Society:</b> Initiatives are centred around users' needs
<b>2</b> Forming strategic alliances, establishing and expanding cooperation	<b>Location, society:</b> System and subsystem capability as well as embedding in international projects support competitiveness and social concerns of the Austrian aviation community.
<b>3</b> Securing existing markets, developing new markets, removing market barriers	<b>Location:</b> Outside visibility is strengthened and positioning within an international environment is supported.
<b>4</b> Developing and training qualified staff, supporting junior staff	<b>Location, environment, society:</b> The best possible education and training of skilled staff and executives across all fields of education produces the creative potential to achieve all goals.

Table 4: Four bundles of measures, source: bmvit 2015

*„The future success of Austrian aviation in international competition is held up by four pillars:*

- 1) A superior command of required problem solving vis-à-vis others. This entails a long-term, goal-oriented and well remunerated promotion of innovation*
- 2) A highly efficient infrastructure to facilitate the investigation and development of such innovation*
- 3) Highly qualified personnel and executives, who are capable of producing such solutions and*
- 4) Cooperative marketing capability in order to convincingly communicate to international customers the specific advantages of Austrian service offers.”*

*Prof. Dr. Horst Schmidt-Bischoffshausen, CEO Strategie-, Technologie- und Innovationsmanagementberatung, previously head of Corporate Research Centre, EADS Germany*





## 1

## Expanding competencies in RTI, better coordination and use of promotion instruments

Here, the following measures are intended:

### 1.a Expanding and adequately remunerating the aviation RTI programme Take Off

- Promotion of cooperative RTI projects that contribute to achieving both growth- and strategic targets.
- Improving the performance capability of the aviation infrastructure (particularly of air traffic management (ATM) in the context of harmonizing the European airspace – Single European Sky/SES) through cooperative, implementation-oriented RTI projects
- Involving system partners in the projects – e.g. within the framework of flagship projects
- Focussing on Austria's strengths

### 1.b Cooperative promotion schemes on a national and international level

- Promotion of national, transnational and international cooperative RTI projects in order to increase performance and sustainability at the location, with close participation of system partners
- Concentration on improving transport connection, developing new procedures and technologies to increase capacity and security, innovative methods to help solve noise and emissions related problems, innovations in the use of alternative energy as well as innovations to reduce running costs by means of increased efficiency
- Extended practice of pre-commercial procurement (PCP) in order to specifically promote innovation in infrastructure and establish business cooperation
- In connection with this, participation of quasi-public bodies is to be encouraged
- Expanding promotion schemes that are closer to the market: since delivery of units/components and system solutions of larger-scale integration plays an ever more important role in aeronautics, it is crucial to expand cooperative RTI promotion schemes along all RTI-relevant technology readiness levels (TRL) 1-6, as well as schemes in TRL 6/7 plus that are closer to the market.



Mag. Peter Kaufmann,  
KMU Forschung Austria

*„I am pleased that many of the suggestions that had arisen from evaluating the Take Off programme are mirrored in the new aviation strategy. The aviation research programme Take Off has so far made a valuable contribution, but the task is not finished yet. Thus, it is important to continue to regard Take Off as a main focus in Austrian research promotion.“*

### 1.c Establishing and implementing bi- and multilateral RTI-initiatives with (e.g.) Germany, the USA, the BRIC countries and Japan (e.g. MoU with Germany)

- Continuation of the European Era-Net AirTN (Next Gen) initiative
- Creating innovative cooperation models in order to strengthen existing (or establish new) research collaboration (e.g. USA, BRICplus, etc.)

### 1.d Expansion of the information base to strengthen supply chains in strategic fields, and to expand systemic fields of innovation

- By financing studies and R&D services, the necessary information base can be created
- Based on analyses by the RTI aviation strategy, individual strategies and/or roadmaps for strategically important issues will be formulated (e.g. for UAS, propulsion technology, structures, cabin interiors and furnishings, maintenance and upgrade, new sales and manufacturer markets, systemic innovation ...)
- Improving the ability to plan contents of calls for tenders
- The basis for this is to be a dialogue for the future held at regular intervals and involving the stakeholders concerned

### 1.e Emphasizing promotion schemes for RTI infrastructure or innovation clusters

- Introducing national promotion schemes for RTI infrastructure. In this, use is to be made of block exemption regulations for large businesses at EU-level for the promotion of RTI infrastructures
- Establishing and expanding test and simulation environments as well as testing and measuring facilities.

### 1.f Expanding accompanying support in grant applications and in the establishment of cooperation networks

- Financial support in feasibility studies in the context of Clean Sky II and other European RTI programmes
- Finding, and focussing on, innovation-related, cross-border strategic partnerships

## 2 Forming strategic alliances, establishing and expanding cooperation

Here, the following measures are intended:

### 2.a Installing a strategic advisory board (RTI-aviation) within the bmvit

- Dialogues for the future held at regular intervals between manufacturers, researchers, developers and universities as support in formulating the strategic information base

### 2.b Establishing groups of RTI experts on strategic topics and developing individual strategies.

- Convening RTI working groups or meetings within the framework of regular networking events to deal with strategic topics
- Realizing synergies and market potential through cross-business transfer of technology

### 2.c Strengthening the representation of Austria in international, research-related aviation councils

- Intensifying the strategically coordinated representation of Austria by the bmvit in RTI-relevant aeronautic advisory boards and organisations on an international level
- Stimulating national participation in RTI aeronautic programmes, for instance, by bringing up RTI-related topics of national relevance in the content development of promotion programmes or by establishing networks and RTI-partnerships in advance.

### 2.d Exploring and accelerating innovation-related, cross-boundary as well as regional, strategic partnerships

- Intensifying and strengthening regional supply chains
- Wider use of research means from the structural funds



DI Walter A. Stephan  
Chairman & CEO FACC AG

*„It is strategically more adequate to present oneself as a “clustered competitor” and to promote complementarity. This is especially true of organisations in Austria that deal with aviation. Here, an advisory board, meeting continually and chaired by the bmvit, and having a strategic agenda and its own organisational form, would make sense.“*



Ing. Michael Holzbauer,  
Director European ATM  
Programs Frequentis AG

*„Detailed strategies are to be devised under the auspices of individual aeronautic organisations. Among other things, the foundation of an ATC/ATM technology cluster is to be furthered.“*

# 3

## Securing existing markets, developing new markets, removing market barriers

For this, the following bundles of measures are intended:

### 3.a Strengthening the international perception of Austria as an aeronautic nation

- Improving national and international visibility of the Austrian aviation sector
- Stimulating, promoting and financing market-oriented international activities that relate to RTI

### 3.b Optimizing standardizing and licensing processes

- Participation in standardizing and licensing processes on an international level
- Support in financing, training and counselling in licences and certifications
- Establishment of quality management processes (especially for SMEs), while, at the same time, specifically elucidating on chances, risks and success factors

### 3.c Expanding the consultation on liability, insurance, and financing measures

- Extension of counselling and information opportunities with regard to financing measures and IPRs. This particularly applies to liabilities (contingent liability in case of failure of development programme), insurances (e.g. product liability insurance, especially with SMEs; insurance to mitigate the effects of exchange rate risks) and low-interest loans for "intellectual investment" (specific conditions for sunrise industries)
- Support in financing for start-ups (venture capital)



*Dr. Reinhard Marak,  
CEO Austrian Industrial  
Cooperation & Aviation  
Technology, Austrian  
Economic Chamber  
(WKO)*

*„The visibility of the performance of the Austrian aviation sector is to be promoted by means of appropriate marketing measures and information campaigns in close cooperation with existing agents and their activities.“*



*DI (FH) Mag. Rafael  
Rasinger, International  
Technology Cooperation,  
Austrian Business Inter-  
national*

*„Foreign and economic missions in the aviation sector, as well as appearing at trade-fairs, are to be coordinated in the best possible way, and existing formats and activities by the WKO (Austrian economic chamber), Austrian Business International, the Austrian Aeronautics Industries Group (AAI) and the bmvit (internationalisation initiative) are to be used in doing so.“*

# 4

## Developing and training qualified staff, supporting junior staff

In this field of action, the following bundles of measures are intended:

### 4.a Establishing endowed professorships, master theses and doctoral dissertations in research areas related to aeronautics and air transportation

- Intensified supervision of master theses and doctoral dissertations by businesses
- Intensified development of the instruments of education activities (e.g. endowed professorships, etc.)

### 4.b Emphasizing the education and training of qualified junior staff in aviation

- Promoting student internships in technology companies related to aeronautics by means of a specific education initiative, "Aviation Talents" (with reference to the already existing "Talents" programme)

### 4.c Developing education strategies from first- to fourth-level education

- Developing strategies for the promotion of interest in technology and of matching education offers, from nursery to university; to be achieved by representatives of the BMBF (Austrian Federal Ministry of Education and Women's Affairs), the industry, bmvit, the FFG (Austrian Research Promotion Agency), (applied) universities and other organisations in an "education task force"

### 4.d Focus on (further) education of staff

- Promoting the further education of staff by means of personnel exchange between companies, through training and (further) qualification also on an international level (e.g. with regard to certification)
- Establishing offers of extra-occupational education, for instance at (applied) universities, for qualified staff of aviation businesses
- Furthering the internationalisation of education activities (e.g. with Africa), for example, via exchange programmes or aviation stipends



Ing. Josef Furlinger, CEO  
RIC GmbH

*„In order to increase the promotion of young talents, the establishment of a “centre for the development of education” is needed to inspire enthusiastic interest in aeronautics in young scientists along their educational paths.“*

## Contributing Stakeholders

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Andreas Aigner  
F. List

Wolfram Anderle  
Austria Wirtschaftsservice

Michael Delion  
Austrian Technik

Susanne Ebm  
Flughafen Wien

Andreas Eckel  
TTTech

Wolfgang Edelmann  
AI-MS

Johanna Egger-Berndorfer  
Brimatech Services

Vera Eichberger  
FFG

Michael Feinig  
Diamond Aircraft Industries

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