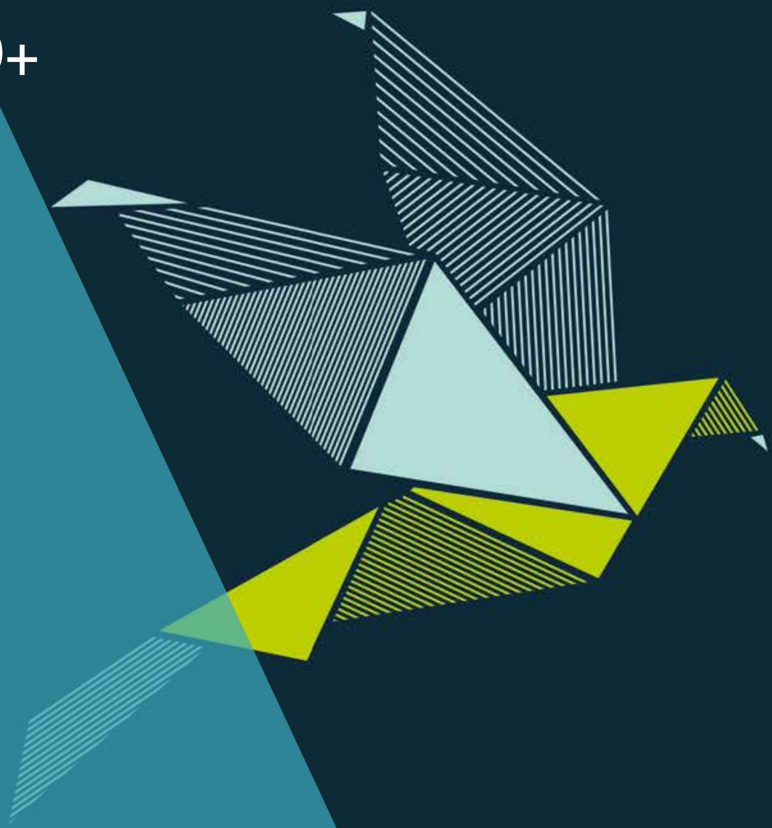
Federal Ministry
Republic of Austria
Climate Action, Environment,
Energy, Mobility,
Innovation and Technology

Climate-friendly Innovations for the Aviation Sector

Strategy for Research, Technology and Innovation for Austrian Aviation 2040+



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Strategy for Research, Technology and Innovation for Austrian Aviation 2040+

Vienna, 2022

Legal notice

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Foreword

Aviation is facing major challenges. The climate crisis and the Covid-19 pandemic are challenging the industry's former certainties, and sustainability is becoming increasingly important. The task of the century, climate protection, remains a defining issue for aviation as well.

Federal Minister
Leonore Gewessler

The mobility system of the future should be comfortable, affordable and climate-friendly. Aviation will continue to be an essential part of international transport, tourism, cultural connections and business. At the same time, we must acknowledge the following: With emissions still continuing to rise year after year—in 2019, CO_2 emissions from flights taking off in Austria were around three times higher than in 1990—climate-neutral aviation is unlikely to be achieved with new technologies alone.

Therefore, the Austrian government programme and the Mobility Master Plan 2030 rely on the principle of "avoid, shift, improve." Where journeys cannot be avoided, different means of transport should be combined according to their expediency and climate-friendliness—on different routes or in a route chain (for example "train to flight"). Ultimately all means of transport should be decarbonised.

We accept the challenge and face the upcoming transformation through the targeted interlinking of air transport policy and RTI policy. The Federal Ministry for Transport, Innovation and Technology has developed two specialised strategies. Both are within the framework of the "Mobility Master Plan 2030" and have been elaborated with close involvement and collaboration of the stakeholder community:

- The "Aviation Strategy 2040+" as an overall strategy for the aviation sector
- The "Strategy for Research, Technology and Innovation for Austrian Aviation 2040+" specific to the topics of research, technology and innovation for the Austrian aviation sector

It is now up to us to join forces to shape the future of aviation in a climate-friendly way. This requires a common vision and clear goals, which my ministry formulated together with partners from research, industry, interest groups and NGOs in the Austrian Aviation Strategy 2040+ for the Austrian aviation sector.

Our common vision for the year 2040 is:

- Aviation in Austria is climate-neutral while maintaining its competitiveness;
- Austria is an international pioneer in climate-friendly aviation innovations;

- Austria remains well-connected to the world while keeping—as a priority—both the overall well-being of the Austrian economy and the freedom of travel of the population.

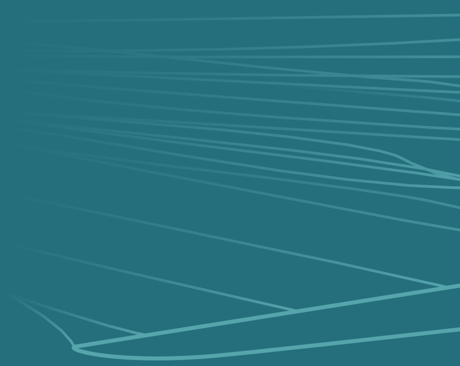
Our motivation is to make aviation green & efficient, future-oriented & competitive, and digital & intermodal. Together, we address key issues such as fair and ecological framework conditions, or a stronger integration of aviation into the overall transport system. Environmental and climate protection, strengthening circularity and creating a resilient and efficient system remain our main focus. Furthermore, innovation, the promotion of technological change and the integration of aviation into a renewable energy system are key elements for safeguarding national value creation. The Austrian population and the economy will benefit from these procedures while maintaining and expanding high safety standards.

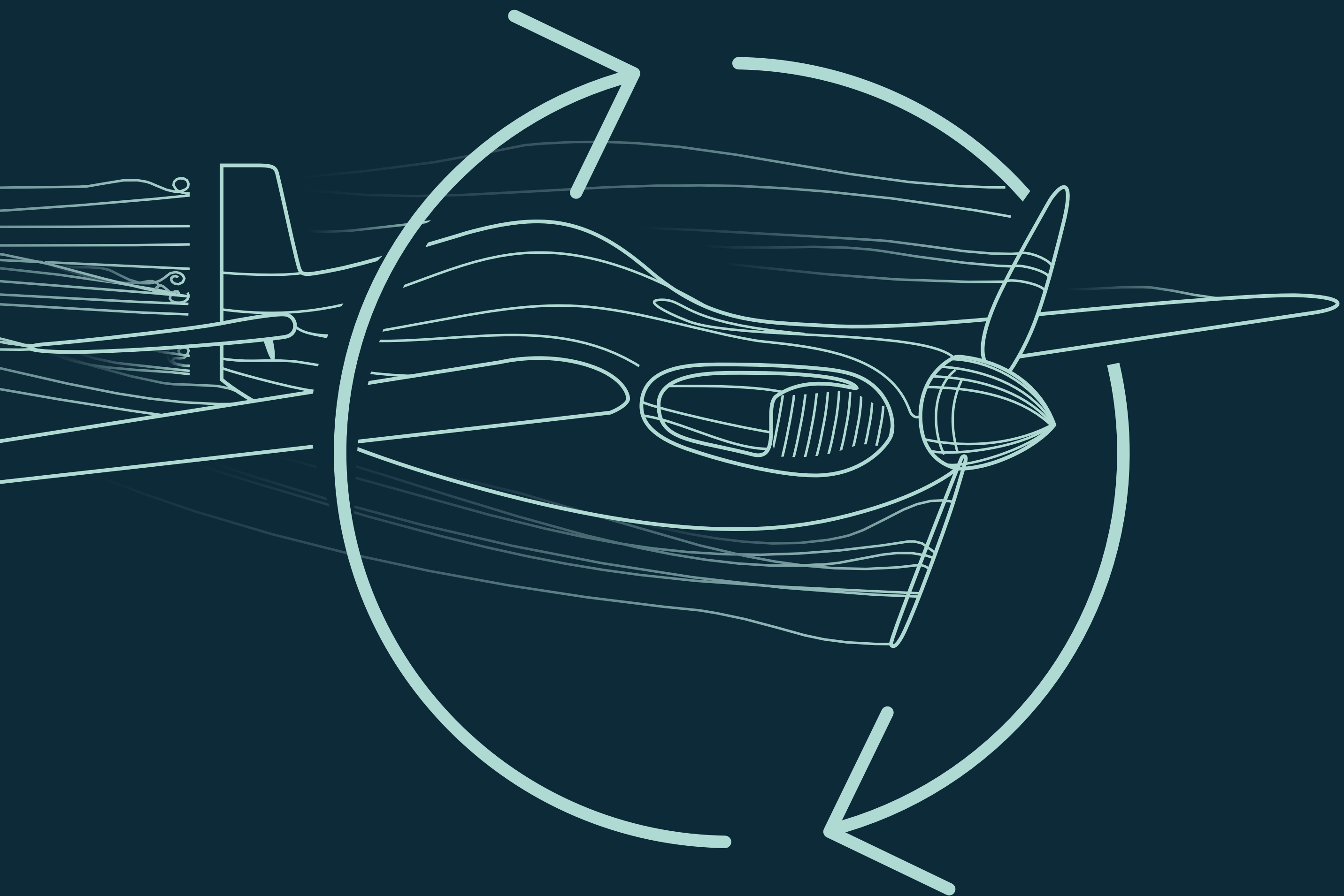
Leonore Gewessler,
Federal Minister for Climate Action, Environment, Energy, Mobility, Innovation and Technology

Inhalt

1 Rethinking aviation

Aviation is undergoing change. Find out how it is changing, how successful Austria is and how the Ministry supports research, technology and innovation on the following pages.





1.1 System change

A system change in civil aviation is emerging on many levels. Meeting the targets in climate protection, energy and mobility requires great effort in research, technology and innovation.

Aircraft, rotorcraft and UAVs (unmanned aerial vehicles) benefit from technological inputs from different industries. Operators are finding new forms of collaboration. Aircraft are used for a variety of applications. The transport of people and goods remains a key focus; yet, new applications are emerging. An example would be to serve as sensors for environmental protection, agriculture or disaster control. Moreover, there are also urgent new challenges in air traffic management. Airports are becoming energy and infrastructure hubs.

What does the ambitious goal of climate neutrality mean for the aviation sector? How are circular economy, resource efficiency, mobility transition or digitalisation changing the framework conditions for research and the aviation supply industry? What opportunities arise from the convergence of industries and the broadening of applications? Which technology fields are promising from both, the Austrians stakeholders perspectives yet as well as in the international environment? To what extent are aviation innovations relevant for society and ecology? How can excellence in research be harnessed quickly?

The Strategy for Research, Technology and Innovation (RTI) for Austrian Aviation 2040+ is based on strategy documents and expert input, both national and international. It focuses on the strengths and competencies of Austrian aeronautics research, industry and suppliers.

The concept of systemic change has significantly influenced the definition of the goals and measures of this strategy. It aims to help shape the transformation and set a framework for RTI funding while ensuring openness to technology.

Challenging times

Civil aviation's key challenge is to minimise its environmental impact. Today global aviation is responsible for approximately 2.5 % of anthropogenic CO_2 emissions. Including non-CO_2 emissions, the contribution to global warming increases to 5 % (DLR, BDLI 2020). Yet aviation, along with shipping, is one of the sectors with fastest increasing emissions: in the last two decades, CO_2 emissions from international aviation have more than doubled (EP 2019). This is due to the disproportionate increase in passenger numbers and global trade.

As set out in the European Green Deal, the set goal is to become climate neutral by 2050 (EC 2019). Austria wants to achieve climate neutrality already by 2040 (Rep. Austria 2020). The Austrian Mobility Master Plan 2030 (BMK 2021) identifies different paths for the transport sector. One target for aviation is that 100 % of aircraft will become climate neutral by 2040. Therefore, the research and innovation have laid their focus on the development of basic principles, technologies, tools and concepts to increase energy and resource efficiency, as well as on the improvement of aircraft and the necessary infrastructure for freedom from emissions and pollutants, noise reduction and traffic safety (BMK 2021, 37, 45).

Aviation faces up to its responsibility

The Clean Sky Joint Undertaking was founded in 2008 as a European public-private partnership to develop cleaner air transport technologies. Efforts in boosting efficiency, improvements in lightweight design and propulsion technologies already lead to a global reduction of 53% CO_2 emissions per passenger kilometre from 1990 to 2019 (Airbus 2021, 12). However, the aviation sector is aware that these efforts have yet to reach far further. Depending on the aircraft type, electric propulsion, alternative fuels or new energy sources must also be used. In addition, the partners in the public-private partnership SESAR (Single European Sky ATM Research) have been working since 2007 on optimising and harmonising European air traffic management. Optimising flight trajectories could save between 240 and 450 kg of CO_2 per average flight (SESAR 2019, 65).

Today such efforts have become more urgent as forecasts indicate a strong increase in air traffic. EUROCONTROL projects 16 million commercial flights in Europe in 2050, which would be equivalent to an average growth of 1.2 % per year (2019 base) (EUROCONTROL 2022). However, the highest increase is yet expected for the Asia-Pacific region where almost half of global air traffic will take place in 2040 (Airbus 2021).

Despite uncertainties on the development of future business travel, energy costs and to the extent a new public environmental awareness will affect passenger numbers, original equipment manufacturers (OEMs) continue to anticipate high demand in the global commercial aviation market. By 2041, Airbus forecasts the demand for new passenger aircraft at 37,100 (Airbus 2022) and Boeing at 40,200 (Boeing 2022). The environmental impact of an aircraft depends on the aircraft size and the flight altitude. In 2019, only a small proportion of EU flights (6 %; long-haul flights over 4,000 km) were responsible for almost half (48 %) of aviation's CO_2 emissions (EUROCONTROL 2021).

At the same time, short-haul flights (less than 500 km) account for 24 % of total aircraft movements but only 3.8 % of CO_2 emissions.

The aviation sector's forecasted growth makes efforts in environmental and climate protection even more urgent. Where air transport cannot be avoided or shifted, the aviation system as a whole must be improved through research and technology development (see also Austrian Mobility Master Plan 2030 (BMK 2021)). Numerous international strategy papers from industry, research and policies affirm and support the project of climate-neutral aviation. Prominent examples, to hint a few, are the "Fly the Green Deal" by the European Commission (EC 2022), "Towards Zero-Emission Aviation" by DLR (DLR 2021) or "Destination 2050—A Route to Net Zero European Aviation" by the association of A4E, ACI-Europe, ASD, CANSO and ERA (A4E et al. 2021).

Aviation is a technology sector with high domestic value creation and internationally esteemed research achievements. The RTI strategy focuses, therefore, on excellent technical solutions, thereby including social dialogue and high innovation speed. Moreover, it is interdisciplinary.

Transformations

As mentioned above, aviation is under a transformation process due to the forecasted global developments and new objectives. Experts are observing a converging of different fields of knowledge (system-of-systems). This is a fundamental prerequisite for tackling issues in the fields of ecology, mobility and digitalisation.

Transformation to the System-of-Systems

Aviation increasingly relies on networks of multiple, heterogeneous, operationally distributed, occasionally independent operating systems thus bringing together and combining individual capabilities and resources. These systems are embedded in networks at multiple levels that evolve over time. The modern aircraft is as much a system-of-systems as air traffic control and the airport.

Ecological transformation

The challenge of climate neutrality is the most important innovation driver in the sector: the conversion from fossil to renewable energy sources in propulsion. This requires new technologies for aircraft, infrastructure and airports, as well as profound research on their impact on the climate and environment. Another integral part of the ecological transformation is the conversion to circular value creation (circular economy).

Transformation of mobility

New holistic mobility concepts have to be developed to turn the traditional idea of transport of people and goods—where it cannot be avoided—to become more environmentally friendly (see Mobility Master Plan 2030 (BMK 2021)). Aviation is part of intermodal solutions for demand-driven, sustainable, flexible and inclusive mobility. Automated aviation supports the shift of freight transport yet requires a connection to rail transport and the development of a corresponding air traffic management system. The key topics are digitalisation, safety technologies and service-based business models.

Digital transformation

The digitalisation of the economy and society changes the ways of working and accelerates development processes, production and maintenance. Virtualisation, automation, sensor technology, additive manufacturing, artificial intelligence (AI) and quantum technology play a key role. At the same time, digitalisation leads to new security challenges. Cyber security becomes systematically more relevant. Sensor technologies, in particular, are an important prerequisite for use-based economical business models that are oriented towards longevity and sustainable use of resources.

This transformation process defines a new phase in the history of global aviation (DLR 2021, 12).

The four major phases in the history of aviation

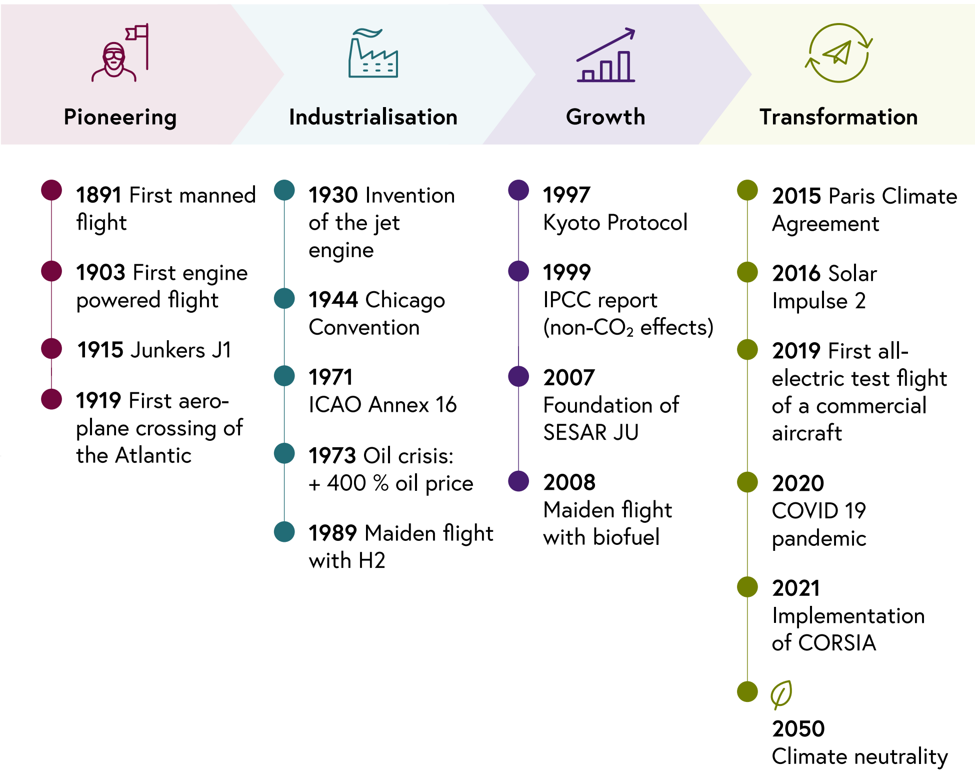


Figure 1: The four major phases in the history of aviation (based on DLR (DLR 2021, 12))

In the first phase, the pioneering phase, the technological principles for aviation were set. The industrial phase of the 1930s was represented by pioneering technological developments, standardisation and regulations. In this period, the aircraft had become an attractive mode of transport. The third phase began in the 1990s and was characterised by exponential growth in aviation. The resulting high increase of CO_2 and non-CO_2 emissions had led to the first research on the climate impact of aviation. The Paris Climate Agreement (2015) and the European Green Deal (2019) initiated the fourth phase of transformation. The necessity to drastically reduce aviation emissions was globally recognised. In addition, another challenge today is to rethink mobility itself as well as the aviation system, wherein digitalisation plays a key role.

Climate-neutral flying needs technology development

Contributions towards climate-neutrality derive, among others, from fuels, propulsion technology, lightweight design and aerodynamics. Further drivers are air traffic management and flight operations.

There are different innovative possibilities and pathways to achieve a climate-neutral aircraft. The three main technology paths in propulsion are hydrogen, hybrid-electric or SAF-powered aircraft. Their integration into the aircraft, as well as the associated infrastructure systems (energy, hydrogen, aviation) are being currently discussed. Compared to fossil fuels, none of these sustainable energy sources is currently marketable. Only the smart combination of the respective properties of the sustainable energy carrier incorporating all disciplines of aircraft design and propulsion technologies can open the way to feasible aircraft configurations that are climate neutral and economical for operators. This transformation affects all components of the air transport system, including the infrastructure. At the same time, it is important to prevent CO_2-independent adverse effects on the atmosphere from other gases and aerosols (BDLI 2020).

According to EUROCONTROL, the path to climate neutrality in commercial aviation by 2050 requires measures in different areas (EUROCONTROL 2022).

Table 1: Measures for climate-neutral aviation by 2050

Measures	**CO_2 saved**	**Share**
Eco-efficient conventional aircraft	47 Mt	17 %
Electric and hydrogen powered aircraft	6 Mt	2 %
Air traffic management (ATM) and flight operations	22 Mt	8 %
Sustainable aviation fuels (SAF)	116 Mt	41 %
Other measures	88 Mt	32 %

Although SAF is the largest contributor to the decarbonisation of aviation by 2050 (41 %), other measures, such as market-based measures or carbon capture, will continue to play a very important role (32 %).

Roadmap towards the decarbonisation of European aviation

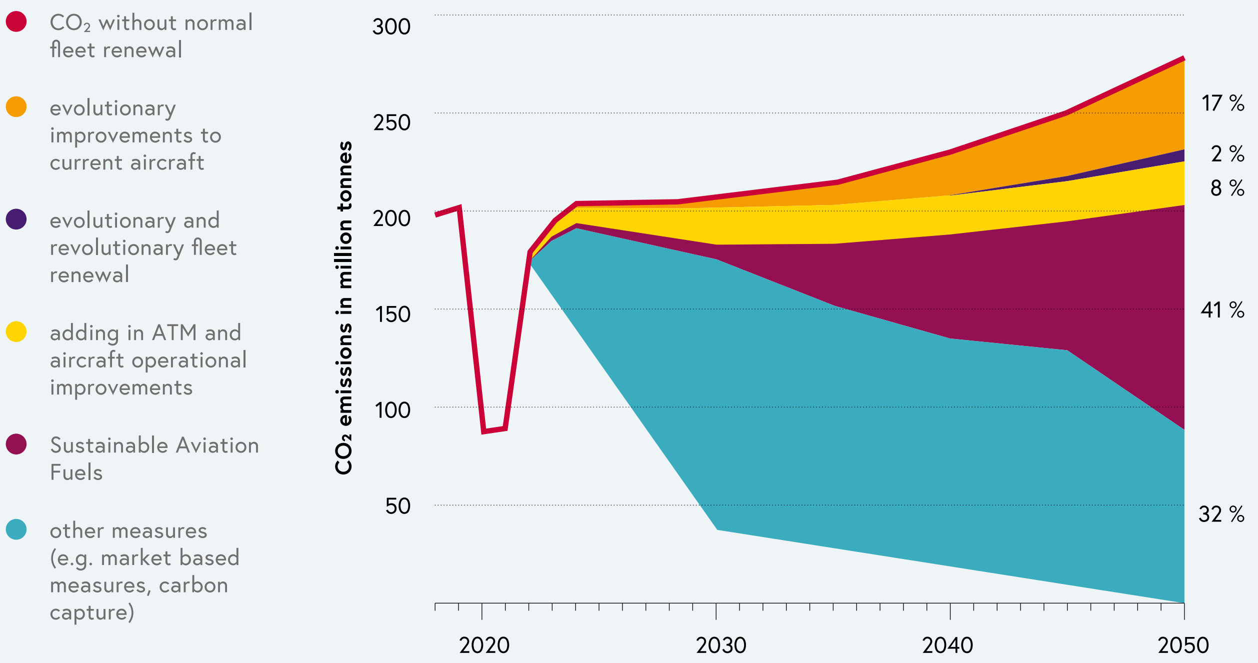


Figure 2: Roadmap for the decarbonisation of European aviation (EUROCONTROL 2022)

Based on the above, the first step is to improve current aircraft to reduce their climate impact (eco-efficient flying). Classical technological areas are aircraft design such as lightweight design, aerodynamics, aircraft systems, functional materials, flight guidance and flight control. In parallel, a new generation of aircraft must be developed. New aircraft configurations and engines are currently being considered to develop climate-neutral aircraft. Depending on their range, different options are feasible. All-electric flying is feasible for regional aircraft. Technological options for medium-haul aircraft are new types of engines, hybrid-electric with SAF, hydrogen fuel cells or direct hydrogen combustion. Long-haul aircraft could be propelled by turbofan or new types of engines with SAF or hydrogen propulsion. (BDLI 2020).

Those new energy sources rely on new developments and innovations in connection with a corresponding energy infrastructure. At the same time, airports can be used as energy hubs. Airports, in the entirety of their functions, must be aligned towards climate-neutrality.

Aviation can do more

There is high demand for transdisciplinary and cross-sectoral cooperation to achieve this transformation while keeping in mind the resulting technological issues. Consequently, this enables faster RTI results and a broader range of applications. Meanwhile aviation applications are not limited to the transport of people and goods. The deployment of aircraft as sensors is the basis for new types of services. The relevant RTI systems go far beyond the current aviation community.

The System-of-systems is emerging. The transfer of technology and knowledge between the areas of space, energy, automotive, medicine, production, digitalisation as well as environmental and climate protection is gaining in importance.

Aviation as a system-of-systems

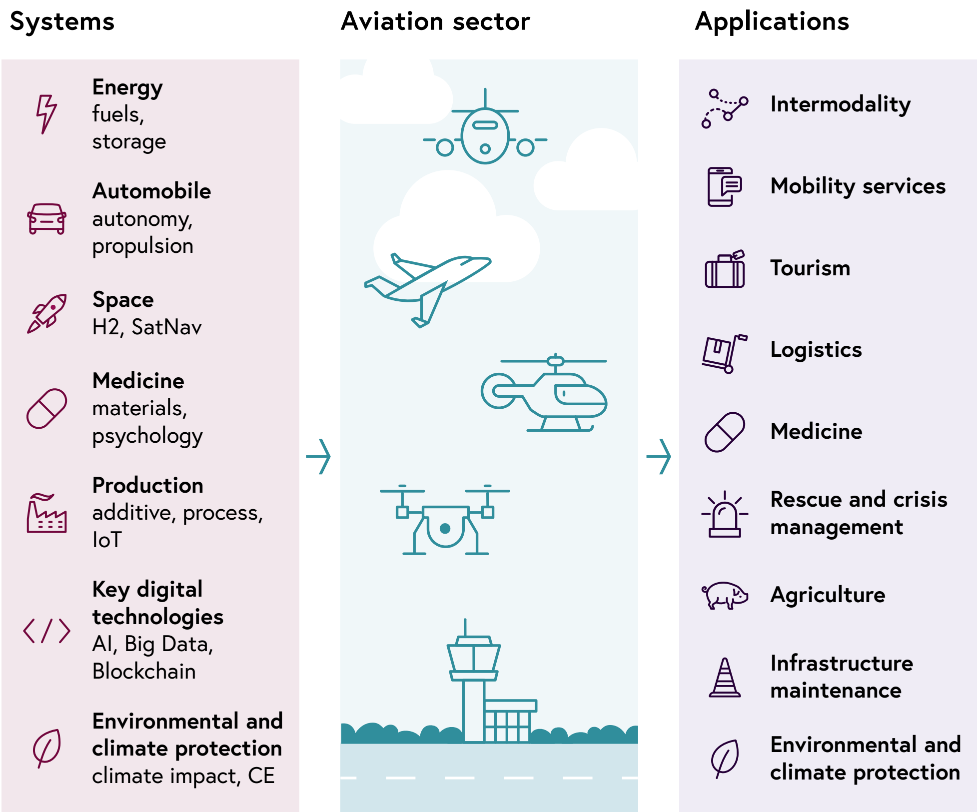


Figure 3: Aviation as a system-of-systems: a system change

The specific range of applications will be significantly expanded, especially through automated aviation and sensor technology. Usage-based business models enable targeted use of resources in mobility and logistics services. The increase in availability allows further applications in rescue services and medicine. Other primarily sensor-based applications are agriculture and forestry, environmental and climate protection, and maintenance of transport and energy infrastructure.

1.2 Achievements

The Austrian aviation industry and research sectors have grown for decades. They are internationally recognised. The sector included 260 companies and 35 research institutes with a total of 15,670 employees in 2019. Compared to 2013, the number of employees in the industry has more than doubled. At the same time the cumulative turnover has increased by more than 40 % to 3.14 billion euros. With 25% of the sector undertaking research activities, this sector is highly innovative.

The number of companies with an aviation-specific ISO:9100 certification has grown by 50% since 2013 to a total of 42.

Take Off, the Austrian national aeronautics research funding programme, has an annual budget between € 10–12 million.

Between 2002 and 2022, 317 national research projects of over € 145 million were funded. Furthermore, Austrian partners have participated successfully in European collaborative aviation research. The total EU contribution from the European Union's multi-annual Framework Programmes for Research and Innovation (including Clean Sky and SESAR) between 2002 and 2022 totalled over € 64,9 million. During the 6th Framework Programme Austrian partners managed to acquire € 9.5 million in funding through 38 participations. This number increased to 61 participations and € 16.1 million EU funding in the 7th Framework Programme (excluding SESAR) and reached 165 participations and € 39,4 million in H2020.

Multiple crises have accelerated the consolidation efforts that are emerging internationally and have shown the importance of vertical value creation at European, but also at the national level. Core competencies need to be developed and built up while system boundaries need to be softened..

Austrian aviation technology and research in figures, status 2019

260
companies

17 %
quota of women

35
research institutes

10–12 m
euros funding annually from the aviation programme Take Off.

15.100
employees
(+ 64 % since 2013)

Ø 25 %
research intensity

23
research institutions

145 m
euros funding from 2002 to 2022 from the Take Off aeronautics programme (in 317 projects, with 979 participations from 356 partner organisations).

3.14 bn.
euros turnover
(+ 44 % since 2013)

Most important export market: Europe

570
employees

64.9 m
million euros return from 2002 to 2020 from the European Framework Programmes (in 178 projects, with 264 participations from 110 partner organisations).

42
companies
ISO 9100-certified
(+ 50 % since 2013)

Figure 4: Austrian aviation technology and research in figures, status 20122

As the majority of companies consists of aerospace suppliers, the dependence lies in the developmental steps of the large OEMs. Nevertheless, it is possible to prepare forward-looking solutions through targeted funding and to develop them further together in international programmes. In this way, further strategic niches can be attained and innovative climate-friendly solutions can be proposed.

1.3 Support

For more than 25 years, the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) has been funding research, technology and innovation in the aviation sector on a strategic policy level. The aeronautics-specific Take Off programme was founded 20 years ago.

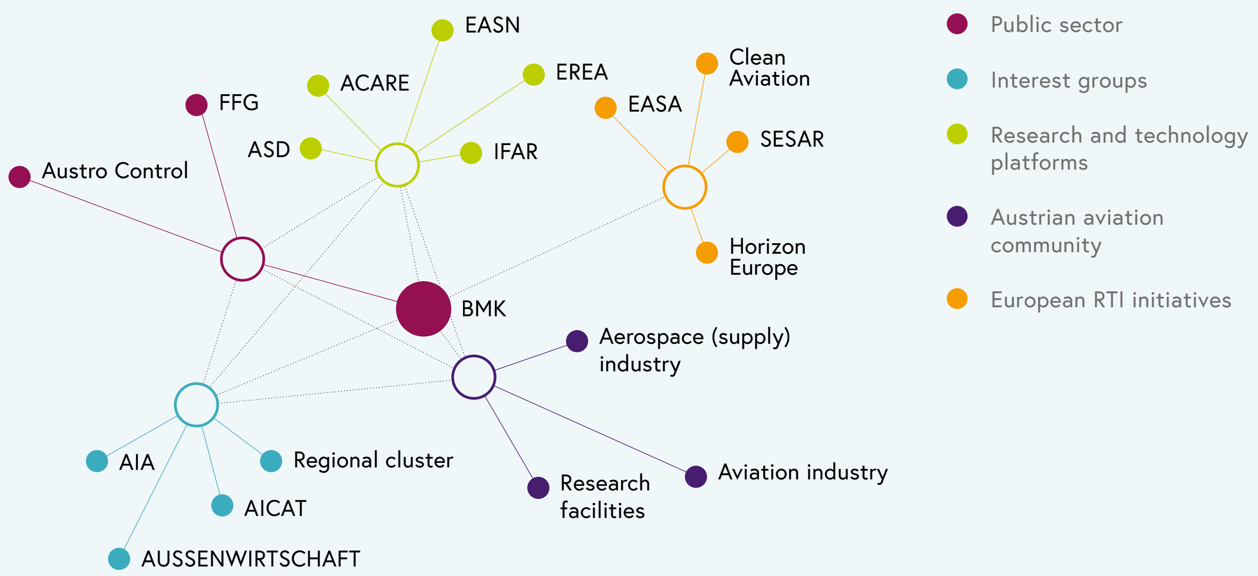
The focus of the first RTI Strategy for Aviation, in 2008, was economic development. The second RTI strategy (2015) fostered, in addition to the economic component, international research activities and the performance of the holistic air transport system.

Much has been achieved and implemented so far. The following initiatives have proven to be particularly trend setting for research, innovation and technology development:

- Strategic theme setting
  - Aviation RTI Advisory Board
  - Representation in international bodies, such as EASA
  - Establishment of national Mirror Groups
  - De-icing strategy
  - Innovation lab as a test environment (AirLabs)
- International cooperation
  - Representation in international research funding programmes, such as SESAR, Clean Aviation
  - Bilateral RTI cooperation with Germany
  - Opening up the national aeronautics programme, Take Off, to international partners
- Qualification and further training
  - Endowed professorships for aviation
  - Certification initiative
- Visibility and networking
  - Delegations and trade fair attendances
  - External appearance open4aviation
  - Catalogue of competence aeronautics.at
  - Networking events

These measures have enabled strategic international collaboration, supported trans-national cooperation and the establishment of relevant research groups, and thus contributed to the visibility of Austrian excellence.

Strategic network of the BMK



BMK's strategic partnerships with various stakeholders in the aviation industry and research include actors from the public sector, the national aviation community, research and technology platforms and interest groups. This also facilitates the coordination of measures and the setting of topics.

Figure 5: BMK Strategic network

1.4 Future prospects

The BMK sets its national priorities for applied research, technology and innovation towards energy transition, circular economy and mobility transition. These together reflect, along with digital transformation, the future challenges of aviation.

Envisaging these trend topics with the aviation related fields of aircraft, production and air transport system, allows the identification of promising future research and technology areas in the respective intersecting fields. Furthermore, the thematic intersections require the inclusion of other, non-aviation-specific sectors, competences and solutions. With this softening of system boundaries, aviation is becoming even more a system-of-systems.

When considering, for example, the intersection of energy transition and aircraft, the following topics are shown: alternative propulsion systems and fuels, increased efficiency through lightweight design, alternative design solutions and aerodynamics, new configurations and the all-electric aircraft – in essence, the path to climate neutrality.

Considering production from the angle of circular economy, material selection, circular design, circular manufacturing processes and life cycle considerations play important roles in any technology decision.

The mobility transition aims to avoid emission-intensive transport operations. Consistent mobility concepts and climate-optimised routing support this goal, as do generative, demand-compliant manufacturing and solutions for noise and emissions reduction.

Digital transformation is the base for unmanned or automated aircraft and their integration in U-SPACE. It's a driver for new control solutions, simulation and virtual certification and creates networking across system boundaries in production. It enables the use of key technologies such as AI or quantum technology, as well as the development of new "as-a-service"-business models. Cyber security, the development of a system-wide data pool and the digital infrastructure for U-SPACE are becoming increasingly important with digitalisation.

The following chart does not claim to be complete; multiple responses have been avoided. Rather, the aim of this illustration is to show the broad spectrum of future technological development topics.

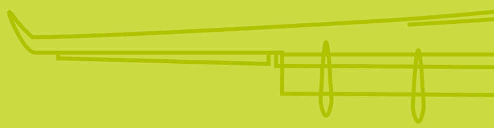
Promising research and technology areas

	Aircraft	Production	Air transport systems
Energy transition	• Alternative drive systems & fuels (battery, SAF, fuel cell, H2-direct, hybrid) • Energy efficiency through lightweight construction, design, aerodynamics, ... • Configurations • All-Electric Aircraft	• Energy efficiency in the manufacturing process • Energy-optimised material mix • Fuel systems	• Climate-neutral airports and airfields • Infrastructure (H2) • Environmentally optimised altitude and route guidance • Formation flying
Circular economy	• Repairability • Reuse • Reproduction • Recycling	• Material Selection • CE design/5 R's • Cycle-oriented manufactu-ring process • Life cycle analysis	• Circular operation of the enterprise • 'as-a-service' business models / shared economy • MRO on the ground
Mobility revolution	• Application-specific transport combinations • Adaptation to use-based business models • Noise and emission-re-duced concepts	• Sustainable logistics concepts • Generic manufacturing on demand	• Airport as a mobility hub • Intermodality, integrated mobility concepts • Accessibility • Climate-optimised flight control
Digital transformation	• Unmanned/automated aerial vehicles • Control (automated, single pilot, ...) • Simulation • Virtual/simulation based certification • MRO (maintenance, repair, overhaul)	• Connected production • Digital twin • AI/blockchain/quantum technology • 'as-a-Service' business models	• Cybersecurity • Build-up of data pool • UAV integration • Digital infrastructure for U-SPACE • Operational efficiency • Human factors

Figure 6: Promising research and technology areas

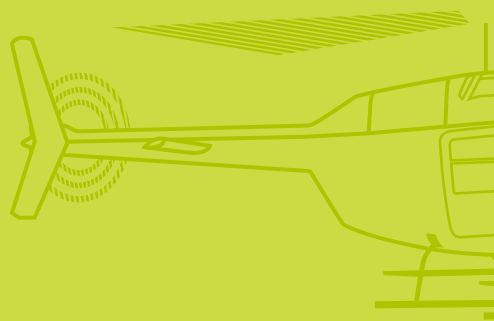
The contents of the figure are mainly based on discussions with top experts and the following sources: R. Henke, "ACARE Vision—wo geht die Reise hin?," Aviation Forum Austria; BDLI (German Aerospace Industries Association), "Nachhaltige und klimaneutrale Luftfahrt aus Deutschland für die Energiewende am Himmel," 2020.

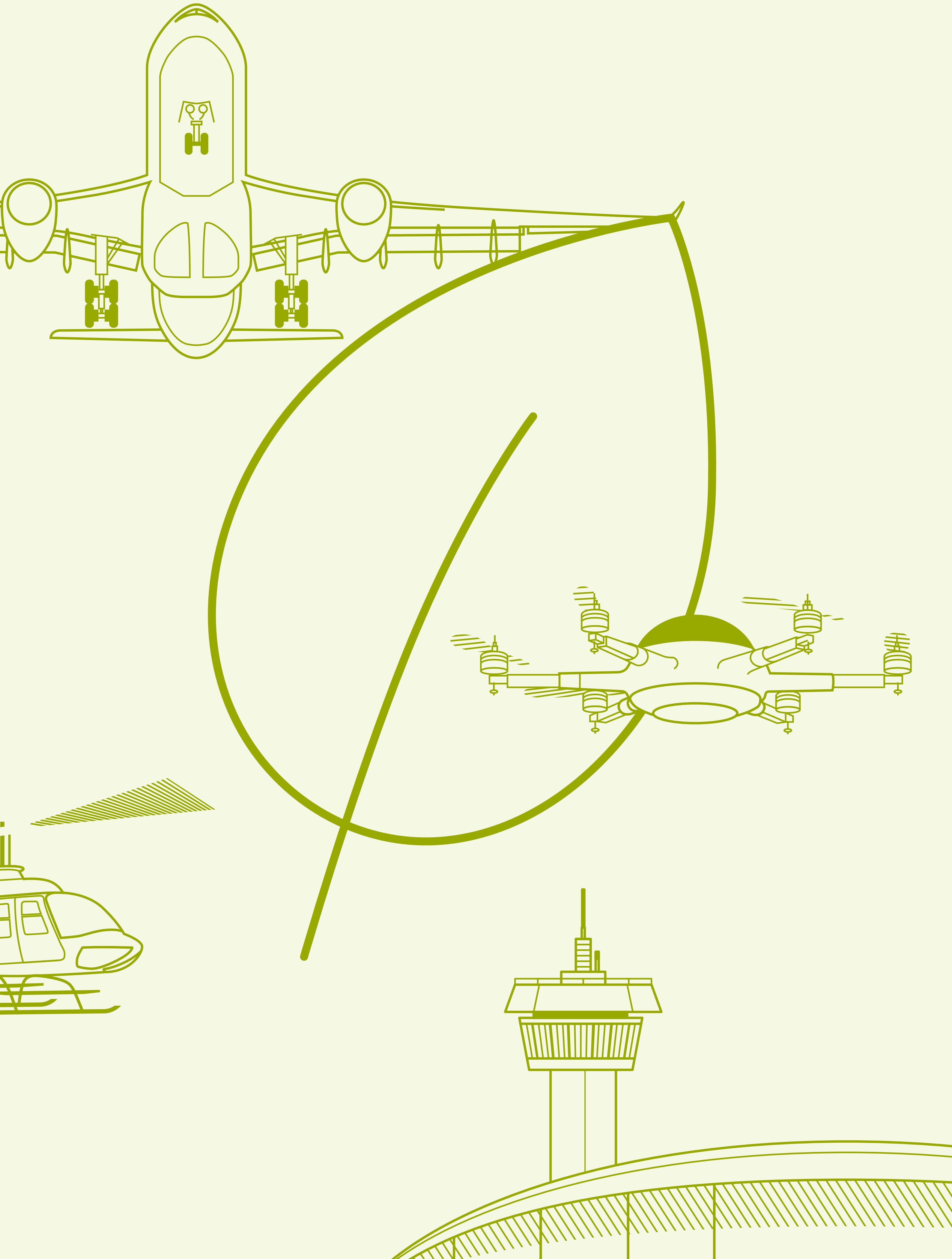
2 We set course for



Green, safe and ambitious!

Austrian Aviation has ambitious targets. In this chapter you will find which ones and what we will do to achieve them.





2.1 Vision

In 2040, Austria will be leading in climate-friendly aviation innovation.

2.2 Strategic goals

The RTI Strategy for Aviation 2040+ specifies through its strategic orientation the aeronautics-related topics of the Federal Government's Research, Technology and Innovation Strategy 2030 (Federal Government 2020). It sets the framework for the coming decades and provides strategic orientation through high-level objectives. By 2040+ Austria's aviation research, technology and innovation (RTI) will be "green and efficient", "future-oriented and competitive" and "digital and intermodal". Clear priorities will steer the technological and thematic development of aviation in Austria.

Green and efficient

The main ambition is the green transformation of aviation. Air traffic and aviation technologies will focus on social and ecological sustainability while maintaining their economic development. FTI sets the course for climate-neutral aviation. Climate- and resource-friendly technologies will be aviation's first priority to tackle climate change. Those technologies will become possible by connecting them with relevant corresponding infrastructures. Austrian participation in circular products and services will thus ensure climate-friendly aviation.

Future-oriented and competitive

RTI can further strengthen Austria's competitiveness. Knowledge-intensive value creation and the high quality of national products and services can secure Austria's position as an internationally recognised partner. Future-oriented technologies vitally contribute to sustainable value chains and increase the resilience of the entire aeronautics supply industry. Interdisciplinary and co-operation critically contribute to solving complex research activities and to securing international value-added shares.

Digital and intermodal

The digital transformation makes way for new potentials and fields of competence for aviation. New services, business models and products can be developed and become available. Aviation is aware of its role in the mobility transition and is more and more becoming part of an intermodal mobility system. Holistic mobility solutions are established through cooperation with other modes of transport. Digital and intermodal RTI solutions are focussed on people. Air travellers benefit from safe, efficient and user-oriented innovations. RTI activities in the areas of safety and (cyber) security ensure the long-term safety and integrity of the entire air transport system.

Figure 7: Strategic and operational goals of the RTI Strategy Aviation 2040+

Strategic and operational goals

green and efficient

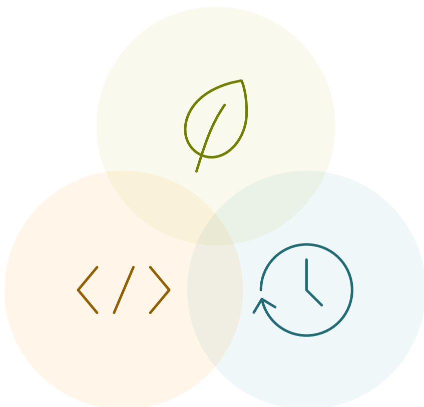
- Climate-neutral aircraft
- Circular aviation industry
- Sustainable aviation system

future-oriented and competitive

- Innovativeness
- Added Value
- Skilled workers
- Ecosystem
- Visibility

digital and intermodal

- Digitale Transformation
- Intermodality and mobility transition
- Safety and security



These overarching goals are closely connected with each other. They have been portrayed through operational goals by displaying target images. The resulting levels of action take place through RTI policy measures.

Goal 1: green and efficient

Austrian RTI aviation will contribute to a more socially, ecologically and economically sustainable society. Innovative, resource- and climate-friendly RTI solutions enable the transformation of the aviation system and the energy and mobility transition in the near future. Accordingly, the ambitious goal and the long path towards climate-neutral flying require research, technology development and innovation in different areas of aviation: from sustainable, alternative fuels and energy sources to circular production and new, revolutionary propulsion, aircraft and mobility concepts.

Climate-neutral aircraft

Austria is a renowned co-developer and component and services supplier of climate-neutral aircraft.

Indicators	Target values until 2040
Austrian OEMs with climate-neutral aircraft in their portfolio	One climate-neutral aircraft per Austrian OEM
Austria as top co-developer/ supplier for green aircraft	Austria among the top 10 suppliers for at least one OEM

Circular aeronautics industry

Austrian aeronautics industrial production is circular-oriented.

Indicators	Target values until 2030	Target values until 2040
Austrian aeronautics industrial production is circular-oriented	40 % of the companies	90 % of the companies

Sustainable aviation system

The Austrian aviation has already incorporated the energy transition in its system: sustainability, efficiency and safety are the focus of research and technology development activities.

Indicators	Target values until 2030	Target values until 2040
Sustainable RTI in air traffic infrastructure and air traffic control	50 % of R&D expenditure at companies (on average, retrospectively 5-6 years)	75 % in Ø of companies (5 to 6 years retrospective)
Climate-neutral airports and airfields with green energy sources	an airport or airfield	100 % of all airports and airfields
RTI projects with sustainability-relevant topics	50 % of all projects (cumulative 2022 to 2030)	75 % of R&D expenditure at companies (on average, retrospectively 5–6 years)

Goal 2: future-oriented and competitive

Austria, as a centre for research, technology and innovation, makes valuable contributions to climate-friendly flying. Core elements for strengthening the competitiveness of aviation RTI are innovative products and services, high international visibility and presence and the development of new business fields. Target-oriented investments in research and development as well as securing qualified specialists contribute to this. In particular, public research funding enables the initiation of new thematic perspectives in aviation and to raise Austria's innovative strength. Successful interaction with European and international stakeholders form an important basis for this. Interdisciplinarity and cooperation are essential for maintaining and building competencies. Opening up the aviation community to newcomers promotes Interdisciplinary work on integrated solutions and the securing of value-added shares for Austria.

Innovative strength

Promoting aeronautical RTI increases national innovation and drives the development of disruptive technologies.

Indicators	Target values until 2030	Target values until 2040
R&D rate of the airlines	30 % of the Ø of the last 5 years	30 % of the Ø of the previous years
Strategic RTI priority topics	3 topics	3 other topics
Scientific publications on sustainable aviation	Ø 5 per year	Ø 5 per year

Value creation

The Austrian aeronautics industry deepens its value-creation, creating jobs, opening up new business areas thereby increasing the resilience of the aeronautics industry.

Indicators	Target values until 2030	Target values until 2040
Number of employees	plus 30 %	plus 40 %
RTI stakeholders in the Austrian aeronautics community	plus 10 %	plus 15 %

Professionals

Austria has a sufficient pool of qualified specialists. Training priorities for aviation are set at all levels.

Indicators	Target values until 2030	Target values until 2040
Aviation-relevant degrees of trained professionals	plus 10 %	plus 20 %
Aviation-related endowed professorship	an ongoing endowed professorship on aviation topics & integration of current professorships into university structures	an ongoing endowed professorship on aviation topics & integration of current professorships into university structures

Ecosystem

Interdisciplinarity, cross-sectoral learning and technology transfer as well as the active involvement of start-ups can increase the speed of innovation and promote the establishment of new competencies and new business models.

Indicators	Target values until 2030	Target values until 2040
Applications and participation of start-ups in national aeronautics tenders	5 % start-up participation (cumulative 2022 to 2030)	10 % start-up participation (cumulative 2031 to 2040)
RTI projects with interdis-ci-plinary topics	60 % of all funded projects (cumulative 2022 to 2030)	80 % (cumulative 2031 to 2040)

Visibility

Austrian technologies and competencies are internationally recognised. The visibility of RTI in aviation and its social significance increases through fact-based/science-based public relations work.

Indicators	Target values until 2030	Target values until 2040
Usage activities of aeronautics.at and open4aviation.at websites	2.500 Ø users per half year	3.000 Ø users per half year
Social media contribution or media presence on RTI in aviation	2x monthly	2x monthly
Aviation RTI events in Austria	1x per year	1x per year

Goal 3: digital and intermodal

RTI activities in aviation actively shape the digital transformation in Austria. The competencies in the areas of digitalisation and automation support the technological progress of aviation. Whether generative manufacturing in aircraft construction, digital air traffic management (ATM) or autonomous unmanned aerial vehicles (UAV), the applications of digital technologies are becoming increasingly diverse. Digitalisation processes are also contributing to shape the mobility of the future. Innovative and intermodal solutions for travellers and personnel on the ground and in the air are necessary in the context of mobility transition. People are at the centre of the development of safe and user-oriented solutions. Therefore, research, technology and innovation must simultaneously consider numerous safety and (cyber) security aspects.

Digital transformation

Researchers and market participants in Austria are using the digital transformation to open up new fields of expertise and business models.

Indicators	Target values until 2030	Target values until 2040
RTI projects with digiti-sa-tion-relevant topics	50 % of all funded projects (cumulative 2022 to 2030)	75 % of all funded projects (cumulative 2022 to 2040)

Intermodality and mobility transition

Air travellers benefit from sustainable, intermodal and user-oriented solutions.

Indicators	Target values until 2030	Target values until 2040
Successful market launch of holistic intermodal solutions	30 % of all funded projects result in intermodal and innovative solutions with market exploitation (cumulative 2015 to 2030)	50 % of all funded projects result in intermodal and innovative solutions with market exploitation (cumulative 2015 to 2040)

Safety und Security

Safety and security solutions from Austria support the safety of the air transport system, especially regarding to automated aviation and cyber security.

Indicators	Target value
Success stories on safety or (cyber) security in aviation	Ø 2 per year

Indicators show specific areas of an objective and set projects, key figures and target values to visualise and quantify goals. Measurement by means of numerous indicators could be a possible way—however another approach was chosen. The focus lies on a small number of highly relevant key performance indicators (KPIs), i.e. a clear and significant system of indicators. The development of these KPIs enables the assessment of the degree of target achievement in comparison to the baseline year of 2019. The target values were deliberately set for the medium to long term to make research and innovation visible. Results and progress rarely happen in a short term or linear fashion, let alone enforced. Through the inclusion of a wide variety of data sources and the mix of punctual and recurring measurements, a broad measurement/assessment can be achieved.

The indicators are used both for policy field control and to inform the interested public about the performance of the administration, the actors and participating organisations in the field of research, technology and innovation in aviation in Austria.

The development of RTI in aviation in Austria thus becomes tangible.

2.3 Mission

Austrian players are drivers for sustainable and pioneering solutions for the aviation system 2040+.

2.4 Measures

Aviation as a system-of-systems interacts with various other sectors and industries. To achieve operational and strategic goals, these reciprocal influences of a multitude of actors, regulations and developments in the system must be considered and steered through various measures.

The measures defined here provide innovative impulses at various levels to promote RTI activities and to support aviation stakeholders through RTI towards the green and digital transformation of the aviation system.

The measures address the following levels:

- Technological level: development and implementation of new technologies and innovations
- Institutional and organisational level: networking and knowledge transfer of actors within and outside aviation
- Social and cultural level: promotion of new (RTI) modes of action by setting incentives (e.g. promotion of entrepreneurship) and establishing new regulations (e.g. setting standards)
- Knowledge level: generating new knowledge and promoting talent

These different levels are interlinked and can therefore influence each other accordingly. For example, new knowledge (e.g. about climate impacts of new propulsion systems) can lead to the development of new standards, new entrepreneurial activities (e.g. spin-offs from universities), and the development of new sustainable technologies. The measures interlock accordingly and promote interdisciplinarity, cooperation and knowledge transfer between the levels or actors in the system.

The measures are foreseen for a comparatively long period and accordingly aim for medium to long-term effects. The establishment and implementation of a strategic impact monitoring system is planned to accompany the implementation of the strategy.

Related measures are presented in a bundle, but can address different goals, as the following chart shows.

The diagram shows that each package of measures refers to at least one, but usually several, operational goals, which in turn are assigned to the three strategic goals, thus working towards the vision (chapter "2.1 Vision" on page„2.1 Vision“ auf Seite 24) and mission (chapter "2.3 Mission" on page„2.3 Mission“ auf Seite 32) of this strategy. Measure 1.1, for example, addresses the operational goal of visibility, which contributes to strategic goal 2 (future-oriented and competitive).

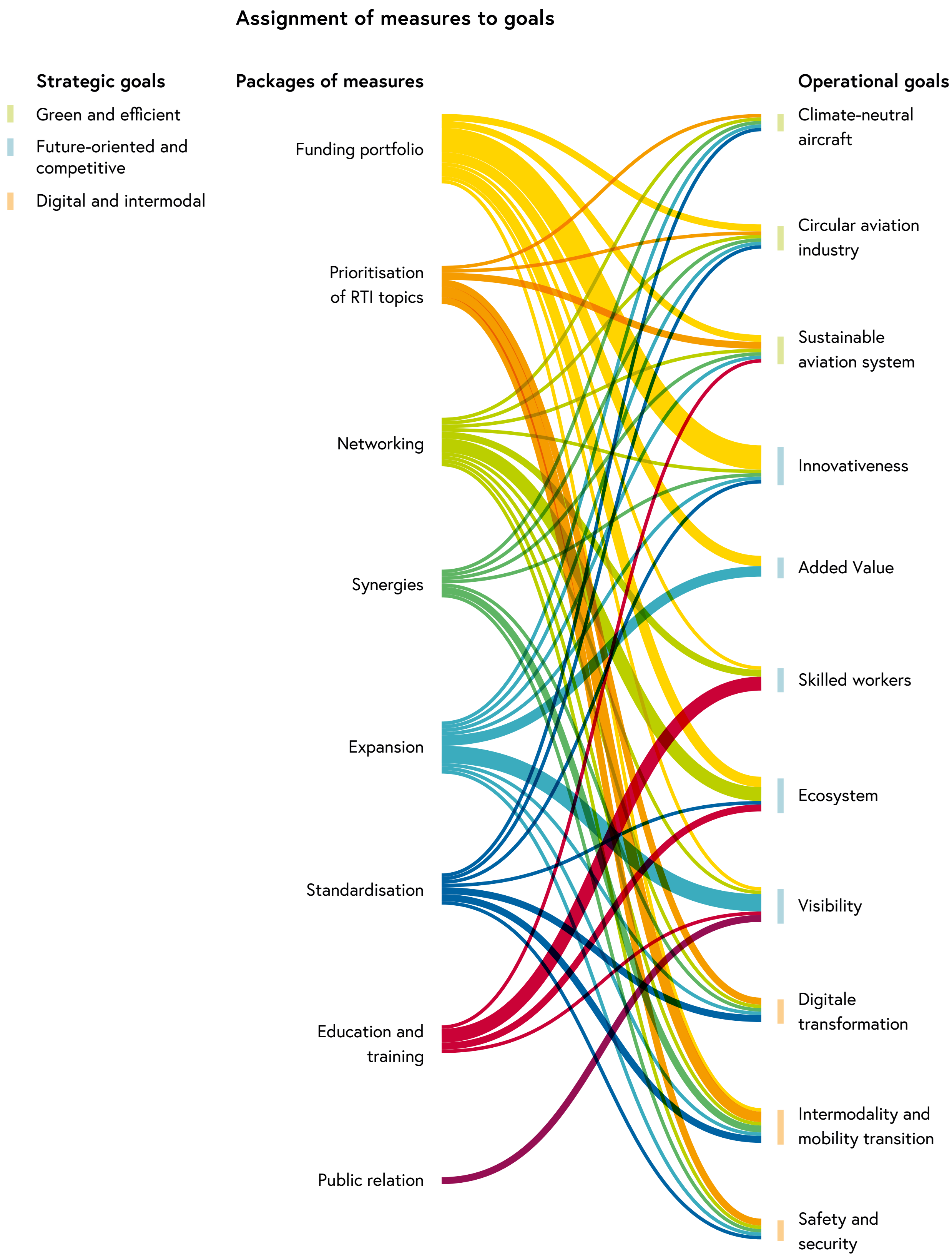


Figure 8: Assignment of measures to targets

The individual measures, combined into superordinate packages, are as follows:

Package of measures 1: Strategic coordination and monitoring by setting up a strategic funding portfolio and target group-specific instruments

The instruments available to the public sector are used in a targeted manner to exploit economic potential and promote the development of skills.

1.1 Establishment and expansion of test and simulation environments, as well as testing, measurement and trial facilities for key topics
1.2 Capacity building and accompanying research on climate impact and impact assessment of new technologies
1.3 Launching innovation competitions on strategic goals and awarding them with prize money
1.4 Full use of the RTI funding portfolio to optimise Austrian value chains and new business models
1.5 Coordination of thematic priorities with circular economy funding calls and measures
1.6 Coordinate target contributions and measures with cross-sectional technology fields & clusters (e.g. ICT/digitalisation, AI, automotive, material science, energy)
1.7 Consideration of the circular economy principles (Refuse, Reduce, Reuse, Recycle, Recover) in accordance with the circular economy strategy and economic, ecological and social sustainability in tenders
1.8 Increased consideration of people as pilots, passengers, technicians etc. and involvement of potential users in the development of innovative concepts and solutions
1.9 Organisation of national and international hackathons, e.g. in the area of new aviation application fields
1.10 Strengthening entrepreneurship in aeronautics

Package of measures 2: Prioritisation of RTI topics for sustainable and safe aviation

By setting priority topics, directions are given to discover, research and develop further those topics becoming important in the future. Thus Austria can position itself successfully in high-quality niches.

2.1 Use of strategic resources (event and networking formats, RTI advisory board) for the joint identification and further development of aeronautics research topics, internationally promising niches etc.

2.2 Stakeholder dialogue on Advanced Air Mobility (AAM)/U-SPACE to define RTI focal points

2.3 Preparation of a national action plan "Energy Transition in Aviation"

2.4 Anchoring safety and (cyber) security in the community

Package of measures 3: Networking and exchange opportunities in the sense of the system-of-systems idea

Activities that support the exchange and transfer of knowledge between different RTI stakeholders are carried out. Dissemination of knowledge on RTI topics relevant to aviation in the future is actively promoted.

3.1 Supporting knowledge and technology transfer between research, technology and application fields through event formats and the utilisation of open innovation tools

3.2 Continuation of the RTI Advisory Board (with representatives from the aviation ecosystem) as a platform for regular exchange and for identifying future topics and relevant RTI topics

3.3 Organisation and initiation of information and discussion events on future topics (including keynotes by top international experts)

3.4 Enabling an exchange of research ideas (for pre-scientific work, master's theses, dissertations, R&D projects) and job postings/internships on open4aviation as well as active application

Package of measures 4: Use of synergies for forward-looking RTI in aviation

Aviation 2040+ is cross-thematic and cross-sectoral. For the optimal promotion of RTI, a coordinated and complementary approach is therefore also necessary among public actors.

4.1 In parallel to the system-of-systems approach: advancing a targeted exchange on relevant topics (mobility, energy, circular economy, space, production etc.) for agenda-setting.; This serves, in particular, to identify leverage effects and define research needs

4.2 Representation of Austrian interests in preparatory bodies for EU funding programmes (Clean Aviation, Horizon Europe etc.)

4.3 Contribute to the development of a holistic interoperability concept considering aviation together with responsible departments

Package of measures 5: Expansion of international cooperation and impulses

Aviation is internationally oriented and embedded in a global RTI network. For this reason, participation in international bodies is beingpromoted and strategic partnerships with other countries are being sought. International networking is promoted to establish and strengthen transnational cooperation and synergies.

5.1 Further expansion of international alliances of the public sector for more cooperation in the field of RTI

5.2 Evaluation and, where possible, development of bi- and multilateral RTI initiatives with other countries

5.3 Support the participation of Austrian industry and research in national and international strategic bodies on RTI (ACARE, SESAR, H2, …) and promote Austria as a location for international working group meetings

5.4 Active involvement and participation in strategic working groups (ACARE-AT)

5.5 Intensify the cooperation with official Austrian representations abroad (e.g. delegation trips and trade fair appearances)

5.6 Establishing new formats for contact exchange with central decision-makers and managers from OEMs and Tier1 companies

Package of measures 6: Foundations for sustainable and secure RTI activities through regulation and standardisation

Proven criteria, standards and procedures provide the framework for the development of safe and sustainable aviation technologies and innovations. Therefore, close cooperation with the BMK's Section IV takes place in the following thematic areas.

- 6.1 Provision of RTI inputs for the development and implementation of regulations for AAM/U-SPACE.
- 6.2 Provision of RTI inputs for new certification and approval procedures; in exchange with aviation stakeholders at national and international level (virtual approval, climate neutrality criteria, SAF/ASTM (American Society for Testing Materials) certification etc.)
- 6.3 Inclusion of research and industry expertise in standardisation committees and working groups

Package of measures 7: Excellent research through attractive education and training opportunities and by intensifying knowledge transfer

The development of a socially, ecologically and economically sustainable aviation system depends on the development of the talents, skills and potential of researchers.

- 7.1 Use of the RTI Advisory Board for further thematic development of aviation-specific education and training offers regarding strategically important areas and target groups
- 7.2 Support education and training initiatives in aviation-specific and related topics of the future
- 7.3 Networking and exchange between already existing endowed professorships, anchoring them in the university landscape and embedding this expertise in international forums
- 7.4 Promotion of international exchange programmes for the networking of international aviation stakeholders, also with the support of endowed professors
- 7.5 Initiation of aviation-specific competitions in cooperation with the industry, e.g. to raise awareness of the importance of apprentices for the aviation industry

Package of measures 8: Publicly effective presentation of RTI results and increasing visibility

These measures aim to present the results of research and development as well as Austrian RTI aerospace players to the public and address the RTI community as well as the general public and young talents.

8.1 Comprehensible preparation of R&D results and success stories for a broad public and their dissemination (e.g. via social media channels, open4aviation, video screens at the airport)

8.2 Illustrating Austria's achievements and the RTI's contribution to society through exhibitions in museums, discussion events or formats such as "The Long Night of Research"

2.5 Implementation

This strategy sets the course for the developments of the next 20 years for research, technology, and innovation in aviation and thus also for the entire aviation industry in Austria.

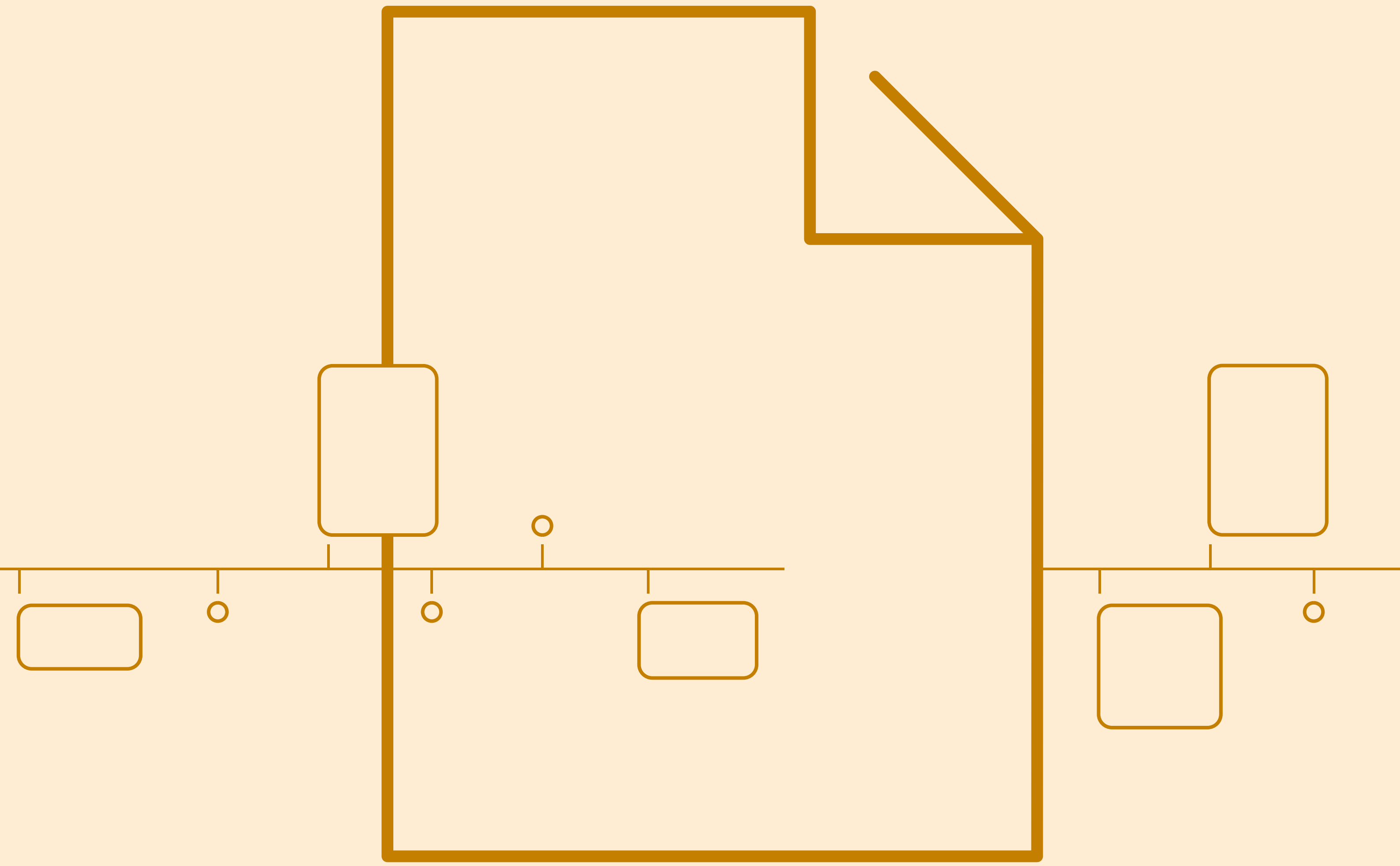
The predefined goals define central directions and have been specified by means of target images. Success is measurable through indicators at a higher level. Recommendations for action are made more precise through measures. The achievement of the goals, indicators and measures will be regularly monitored and evaluated. This will ensure a rapid and appropriate response to deviating developments.

Monitoring—understood as regular, periodic, and criteria-based measurement of the current status—is carried out by the BMK and the institutions and agencies involved. The indicators shown here will be continuously measured and compared with the desired target state within the framework of proven monitoring systems. Furthermore new survey mechanisms will also be established..

The strategic planning, concrete design, implementation, and execution of RTI policy can be ensured through **evaluations** that are committed to scientific principles. By means of accompanying studies and evaluations, a deeper understanding of research, technology, and innovation in the policy field of aviation is created.

3
Background

You can find out more about the basis on which our ambitious goals were developed and which stakeholders were involved in the development of the strategy here.



The goal of the RTI Strategy for Aviation 2040+ is to actively shape the transformation process that aviation is currently undergoing. It aims is to create a framework in which Austria can make its contribution to environmentally friendly aviation through climate-friendly aviation innovations.

The strategy builds on the strengths and competencies of Austrian aviation research community, the aeronautics industry, and suppliers. It responds to current challenges and trends, and it is further oriented towards national and international strategies and initiatives.

The strategy is aimed at all Austrian stakeholders from the fields of aeronautics technology and research as well as relevant non-aeronautics-specific areas. It provides orientation and sets the course for Austrian activities in the coming years.

3.1 Process

The RTI Strategy Aviation 2040+ was prepared under the leadership of the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) in the period May 2021 to June 2022. It was developed in cooperation with the core team for aviation (BMK, FFG, AustriaTech), Brimatech and KMU Forschung Austria and in dialogue with numerous stakeholders in the aviation sector.

The strategy development process was designed to be agile right from the start. Despite tight time and content planning, it was open to goal-oriented suggestions from stakeholders. It was highly important to broadly involve the different actors of the Austrian RTI aviation community. For Austria, as a small country in the heart of Europe, integration into international strategies and approaches is indispensable. It attempted to objectively represent numerous points of views.

The core elements of the methodological approach can be outlined as follows:

- Kick-off with Federal Minister Leonore Gewessler
- Development process together with the European Aviation Innovation Strategy "Fly the Green Deal" and the Strategic Research & Innovation Agendas of SESAR and Clean Aviation
- Development in coordination with the Austrian Aviation Strategy
- Strategy screening: analysis of 70 international aviation-relevant strategy documents and the roadmaps from 19 countries as well as embedding in relevant Austrian strategies (e.g. hydrogen, circular economy, Mobility Master Plan, …)
- Online survey: 152 Austrian organisations (three of them anonymous)
- 36 discussions with 49 national and international experts
- Numerous coordination meetings and workshops with the core aviation team
- Validation by the Strategic RTI Advisory Board Aviation

The exchange with different actors and interest groups aimed at achieving the highest possible acceptance in the community. A final validation with representatives of the Austrian aeronautics industry and research additionally ensured the stakeholder consensus.

3.2 Stakeholder

The following stakeholders were involved in the strategy development process.

Core Team Aviation Innovation

- Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK): Ingrid Kernstock, Theresa Bauer
- Austrian Research Promotion Agency: Vera Eichberger, Bernhard Gerl, Harald Krautgasser-Seidl, Sabine Kremnitzer, Hans Rohowetz
- AustriaTech – Association of the Federal Government for Technology Policy Measures GmbH: Andreas Wiesinger, Annika Dollinger

RTI Advisory Board Aviation

- Walter Stephan: AAI – Austrian Aeronautics Industries Group
- Dr. Christian Chimani: AIT Austrian Institute of Technology GmbH
- Francesco Sciortino: Austrian Airlines AG
- Philipp Piber: Austro Control Austrian Association for Civil Aviation mbH
- Thomas Haagensen: easyJet Europe
- Katharina List-Nagl: F. LIST GMBH
- Robert Machtlinger: FACC AG
- Dr. Holger Friehmelt: FH JOANNEUM Luftfahrt/Aviation
- Raoul Fortner: FH Consult
- Dr. Hannes Bardach: Frequentis AG
- Dieter Grebner: Peak Technology GmbH
- Roland Zeilinger: PRIME aerostructures GmbH
- Franz Hrachowitz: RTA Rail Tec Arsenal Fahrzeugversuchsanlage GmbH
- Hannes Hecher: Schiebel Aircraft GmbH
- Dr. Sabine Seidler: Technische Universität Wien
- Kurt Doppelbauer: TTTech Computertechnik AG
- Dr. Sergio Amancio: TU Graz / BMK Stiftungsprofessor Werkstoffe und Fertigung
- Dr. Martin Berens: TU Wien / BMK Stiftungsprofessor Luftfahrtsysteme
- Dr. Carl-Herbert Rokitansky: Universität Salzburg
- Dr. Reinhard Marak: WKO Wirtschaftskammer Österreich – ARGE Sicherheit und Wirtschaft
- Bernhard Wagner: Zoerkler Gears GmbH

National and international experts

36 interviews were conducted with 49 experts

National experts

- Air Ambulance Technology GmbH: Wilhelm Schnedl
- AIT Austrian Institute of Technology GmbH – LKR Leichtmetallkompetenzzentrum Ranshofen GmbH: Rudi Gradinger
- Austrian Airlines AG: Barbara Hotz
- Austro Control Österreichische Gesellschaft für Zivilluftfahrt mbH: Dr. Valerie Hackl
- F. LIST GMBH: Markus Inäbnit
- FACC AG: Robert Machtlinger
- FH JOANNEUM – Institut Luftfahrt: Dr. Holger Friehmelt
- Frequentis AG: Dr. Hannes Bardach, Dr. Günther Graf, Michael Holzbauer, Markus Klopf, Stefan Steinhauser
- netwiss OG: Bernhard Rüger
- OMV Refining & Marketing GmbH: Michaela Jarosch (OMV AG), Dr. Dirk Langhammer, Dr. Wolfgang Vollnhofer, Fabian Wedam
- Pankl Aerospace Systems Europe GmbH: Horst Rieger
- Peak Technology GmbH: Dieter Grebner
- PRIME Aerostructures GmbH: Roland Zeillinger
- Schiebel Elektronische Geräte GmbH: Hannes Hecher
- Stephan GmbH: Walter Stephan
- TEST-FUCHS GmbH: Volker Fuchs
- TTTech Computertechnik AG: Kurt Doppelbauer
- Technische Universität Graz: Prof. Dr. Sergio Amancio, Prof. Dr. Franz Haas, Prof. Dr. Franz Heitmeir
- Technische Universität Wien: Prof. Dr. Martin Berens, Rektorin Sabine Seidler, Prof. Dr. Michael Weigand
- VCÖ – Mobilität mit Zukunft: Lina Mooshammer, Ulla Rasmussen
- voestalpine Böhler Aerospace GmbH: Thomas Kornfeld
- Zoerkler Gears GmbH: Hanns Amri

International experts

- AIRBORNE Consulting Hamburg GmbH: Dr. Gerald Wissel
- Airbus und aireg: Siegfried Knecht
- Bauhaus Luftfahrt e.V.: Prof. Dr. Mirko Hornung
- Boeing Deutschland GmbH: Dr. Michael Haidinger, Johannes Ropers, Roger Gilles
- Bundesverband der Deutschen Luft- und Raumfahrtindustrie e.V.: Dr. Stefan Berndes
- Clean Aviation Joint Undertaking: Axel Krein

- Deutsches Bundesministerium für Wirtschaft und Klimaschutz: Dr. Rene Reinhardt, Sabine Honer, Dr. Daniel Riedel
- Für das Deutsches Zentrum für Luft- und Raumfahrt e.V.: Prof. Rolf Henke
- European Commission – DG Research & Innovation: Jane Amilhat, Andrea Gentili
- XU Group GmbH: Dr. Justus Broß

Austrian organisations

152 Austrian organisations participated in the online survey; three of them anonymously.

- A.F. AEROSPACE CONSULTING e.U.
- AC2T research GmbH
- ACoS GmbH
- Adolf Heuberger Eloxieranstalt GmbH
- Aeroficial Intelligence GmbH
- AeronautX Aviation Services GmbH
- Aerospace & Advanced Composites GmbH
- AeroTex GmbH
- AICO EDV-Beratung GmbH
- Air Ambulance Technology GmbH
- AIT Austrian Institute of Technology GmbH – Center for Low-Emission Transport
- AIT Austrian Institute of Technology GmbH – Center for Vision, Automation and Control
- AIT Austrian Institute of Technology GmbH – LKR Leichtmetallkompetenzzentrum Ranshofen GmbH
- Albatros Engineering GmbH
- ALPEX Technologies GmbH
- AMAG rolling GmbH
- AMES GesmbH
- AmiSTec GmbH
- Amteq GmbH
- Antemo GmbH
- APELEON by VOLARE GmbH
- ASQS GmbH
- Austro Control Österreichische Gesellschaft für Zivilluftfahrt mbH
- Aviation Avionic Service GmbH
- bionic surface technologies GmbH
- Bosch General Aviation Technology GmbH
- Boxmark Leather GmbH & Co KG
- Breitenfeld Edelstahl AG
- BRP-Rotax GmbH
- CEA Design GmbH
- CERATIZIT Austria GesmbH

- CEST Kompetenzzentrum für elektrochemische Oberflächentechnologie GmbH
- Cloudflight Austria GmbH
- CNC Solic Fertigungstechnik GmbH
- CoLT Prüf und Test GmbH
- Combustion Bay One e.U.
- CT Engineering GmbH
- CycloTech GmbH
- DEWETRON GmbH
- Diamond Aircraft Industries GmbH
- DIPROmed GmbH
- easyJet Europe Airline GmbH
- EBM GmbH
- E-P-C Ebetsberger Partner CNC GmbH
- F. LIST GMBH
- FACC Operations GmbH
- FH JOANNEUM – Institut Luftfahrt
- FH Kufstein Tirol
- FH Oberösterreich
- FH Wiener Neustadt – Aerospace Engineering
- Fill GesmbH
- Flightkeys GmbH
- Flughafen Wien AG
- FOTEC Forschungs- und Technologietransfer GmbH
- Frequentis AG
- Fuchshofer Präzisionstechnik GmbH
- GPV Austria GmbH
- Greiner aerospace GmbH
- Haumberger Fertigungstechnik GmbH
- Helikopter Air Transport GmbH
- Helios Hubschraubertransport GesmbH
- HICO GmbH
- Hitzinger Electric Power GmbH
- HTK Maschinen und Apparatebau GmbH
- HTP High Tech Plastics GmbH
- Ing.Prägler GmbH
- INTALES GmbH
- Isovolta AG
- ISW-MCE GmbH
- Jakadofsky GmbH
- JOANNEUM RESEARCH Forschungsgesellschaft mbH. MATERIALS – Institut für Oberflächentechnologien und Photonik

- JOANNEUM RESEARCH Forschungsgesellschaft mbH. DIGITAL – Institut für Informations- und Kommunikationstechnologien
- Johannes Kepler Universität Linz – Institute für Konstruktiven Leichtbau
- Johannes Kepler Universität Linz – Institut für Strömungslehre und Wärmeübertragung
- Johannes Kepler Universität Linz – Institut für Völkerrecht, Luftfahrtrecht und Int. Beziehungen
- kcm-consulting München-Wien
- Kobleder GmbH
- Kollmann-NDT
- KOWE CNC GmbH
- KTS GmbH
- Lakeside Labs GmbH
- Langzauner GmbH
- LieberLieber Software GmbH
- Linz Center of Mechatronics GmbH
- Lithoz GmbH
- LUXNER Engineering ZT GmbH
- MAGNA STEYR FAHRZEUGTECHNIK AG & CO KG
- Materials Center Leoben Forschung GmbH
- MICADO SMART ENGINEERING GmbH
- Milltech GmbH
- Montanuniversität Leoben – Lehrstuhl für Metallkunde und metallische Werkstoffe
- Mubea Carbo Tech GmbH
- netwiss GesmbH
- Neuböck Innovative Engineering e.U.
- Österreichisches Institut für Vereisungswissenschaften in der Luftfahrt
- Pankl Aerospace Systems Europe GmbH
- PAYR Engineering GmbH
- Peak Technology GmbH
- Polymer Competence Center Leoben GmbH
- PRIME Aerostructures GmbH
- Professional Aircraft Engines GmbH
- RECENDT – Research Center for Non-Destructive Testing GmbH
- Redak Consulting GmbH
- Rheologic GmbH
- RHP Technology GmbH
- RISC Software GmbH
- Robert Bosch AG, Vertriebsbereich sia Abrasives
- RO-RA Aviation Systems GmbH
- Rosenbauer International AG
- RPD – Rapid Product Development GmbH

- RTA Rail Tec Arsenal Fahrzeugversuchsanlagen GmbH
- RÜBIG GmbH & Co KG
- Sabre Austria GmbH
- SBI GmbH
- SCE SystemEngineering GmbH
- Schiebel Elektronische Geräte GmbH
- schleiffelder.aero
- SG concepts gmbh
- Siemens Digital Industries Software
- SKYOPTIK e.U.
- SOLITEC Software Solutions GmbH
- STAP GmbH
- Stephan GmbH
- system7 metal technology GmbH
- Technische Universität Graz – Institut für Hochfrequenztechnik
- Technische Universität Graz – Institut für Thermische Turbomaschinen und Maschinendynamik
- Technische Universität Graz – Institute of Materials Research, Joining and Forming (IMAT)
- Technische Universität Wien – Institut für Chemische Technologien und Analytik
- Technische Universität Wien – Institut für Energietechnik und Thermodynamik
- Technische Universität Wien – Institut für Fahrzeugantriebe und Automobiltechnik
- Technische Universität Wien – Institut für Konstruktionswissenschaften und Produktentwicklung, Forschungsbereich Maschinenelemente und Luftfahrtgetriebe
- Technische Universität Wien – Institut für Leichtbau und Struktur-Biomechanik
- Technische Universität Wien – Institut für Mechanik und Mechatronik
- TEST-FUCHS GmbH
- TIZ Landl – Grieskirchen GmbH
- Transfercenter für Kunststofftechnik GmbH
- Treibacher Industrie AG
- TTTech Computertechnik AG
- University of Salzburg – Aerospace Research
- Villinger GmbH
- voestalpine Böhler Aerospace GmbH
- voestalpine Böhler Bleche GmbH & Co KG
- WFL Millturn Technologies GmbH & Co KG
- Wieland Austria GesmbH
- Wollsdorf Leder Schmidt & Co Ges.m.b.H.
- ZIMEX Aviation Austria AG
- Zoerkler Gears GmbH & Co KG

For an overview of the parties involved in the Austrian aeronautics industry and research, as well as their technological competences, please refer to the online platform aeronautics.at.

The online platform open4aviation.at provides an overview of research, technology, and innovation activities in the Austrian aviation sector.

3.3 Strategy development

Vision, objectives and measures were developed in an iterative process in close coordination with the BMK in a series of workshops. Based on the vision and mission for Austrian RTI in aviation, the objectives were summarised at three strategic levels. Strategic goals 1 and 3 are topic-related and are oriented towards current technological, socio-economic, and political developments in aviation. Strategic objective 2 "future-oriented and competitive" lays the foundations for successful research, development, and innovation in aviation. They are reflected in the operational objectives of innovative strength, value creation, skilled labour, ecosystem and visibility. Results from the stakeholder survey and the international aviation strategy screening were also taken into account at defining the objectives and measures. The measures are formulated as activities to be carried out that contribute to the achievement of the operational objectives. The possibilities of directly influencing the achievement of objectives are limited due to the large number of influencing factors at the various levels (see chapter 2.3). Indicators are used to check whether the operational goals have been achieved.

Indicators highlight specific areas of an objective and set projects, metrics, and target values to visualise and quantify goals. By identifying a few but highly relevant KPIs, the effort of collecting and merging comprehensive data sets is efficiently reduced. The KPIs should shed light on the goals as comprehensively as possible, i.e. create as few "blind spots" as possible and at the same time be relevant indicators in the topic area.

To achieve this, a clear, lean, and meaningful system of key figures was defined in numerous iterations. In each case, the changes in these key figures allow an assessment of the degree of target achievement. The target values were deliberately set for the medium to long term to make research and innovation visible—this rarely happens in the short term, in a linear fashion or can even be forced. Through the inclusion of a wide variety of data sources and the mixture of punctual and recurring measurements, a broad measurement/assessment is achieved.

These RTI indicators serve on the one hand to steer the policy field and on the other hand to inform the interested public about the performance of the administration, the actors and the participating organisations in the field of research, technology and innovation in aviation in Austria.

The development of RTI in aviation in Austria thus becomes tangible.

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