**ACARE’s view on the future of European Aviation Research and Innovation**

Aviation is recognised as one of the top advanced technology sectors in Europe and generates innovation that benefits society at large far beyond its direct operational sphere. It ensures passenger and freight mobility thereby generating wealth and economic growth (total turnover equates to more than €160bn), contributes significantly to European competitiveness and the balance of trade, provides half a million highly qualified jobs, fosters Europe’s knowledge economy through R&D investment of about ca. 12% of its turnover, and contributes in many different ways to global safety and security[[1]](#footnote-1). European demand for air transport is anticipated to grow continuously until 2050 and beyond, while capacities are already limited today. Sustainable mobility solutions are required to satisfy this growth and it is essential that travel remains or becomes even more safe, secure, fast, affordable and environmentally friendly. Industrial competition is fierce, not only from established world regions but also from new, strong challengers.

**Flightpath 2050**

In 2011 a European group of personalities set out a vision of European aviation with the publication of Flightpath 2050. The ambitious goals of Flightpath 2050 are set to deliver two aims: firstly to serve society’s needs for safe, more efficient and environmentally friendly air transport; and secondly, to maintain global leadership for Europe in this sector with a competitive supply chain and competitive operators. The roadmap to achieve these goals can be met by addressing the following key challenges:

* Challenge 1: Meeting societal and market needs
* Challenge 2: Maintaining and extending industrial leadership
* Challenge 3: Protecting the environment and the energy supply
* Challenge 4: Ensuring safety and security
* Challenge 5: Prioritising research, testing capability and education.

**ACARE’s strategic research and innovation agenda**

In 2012 ACARE had developed a strategic research and innovation agenda (SRIA) to meet the challenging goals set by Flightpath 2050. Research and innovation in aviation is the key to tomorrow’s mobility and prosperity as well as environmental and energy challenge.

Since 2012 a number of external factors and boundary conditions have changed, and together with other developments have prompted ACARE to update the SRIA. Examples of these trigger factors are:

* Cybersecurity threats, e.g. to aircraft equipment or ATM systems
* Developments in digitalisation (AI, Big data, data science, ML and deep learning)and electrification of transport
* Future stringency in emissions standards for CO2, NOx and ultra-fine particles
* Increased importance of noise annoyance and health impacts
* New mobility system concepts (e.g. Urban Air Mobility), stakeholders, business models and vehicle types including autonomous or remotely-piloted aircraft systems
* New technologies, materials, manufacturing processes and system concepts vital for the European aviation sector
* Availability of appropriate research and test infrastructure as well as of a capable work force

Furthermore, research undertaken since the first edition of the SRIA by European, national and regional programmes, both private and public, has produced tangible results which needed to be considered.

These results and changed boundary conditions triggered the release of an update of the SRIA in June 2017.

Some examples of results had been published by ACARE it its success stories brochure in 2015:

* Total Airport Management Suite (TAMS) optimising airport operation decision making
* Remote Tower Services
* High lift Aerodynamics
* Light Helicopter Demonstrator with High compression Engine (HCE)
* European FP7 projects on Renewable Jet Fuel (e.g. SOLAR-JET)
* FLYSAFE – Airborne Integrated Systems for Safety Improvement, Flight Hazard Projection and All Weather Operations
* School\_labs – Best practices for attracting Young People to Research and Science

Wider spin-off effects from aviation benefit industries across a whole spectrum of economic activities. An example of spill over is a Railway Collision Avoidance System (RCAS) developed by DLR based on concepts developed in Aerospace applications.

**ACARE recommendation to implement SRIA**

In order to achieve the Flightpath 2050 goals, ACARE recommended in its first SRIA that Europe must:

* Lead the development of an integrated resilient European (air) transport system
* Maintain global leadership
* Establish efficient and effective policy and regulatory frameworks
* Provide incentives and long-term R&T programmes
* Champion sustainable growth to further reduce emissions/noise
* Maintain the sector’s safety track record
* Provide long term thinking

Whilst the above still remains valid, the action areas detailed in the updated SRIA identified the following additional recommendations:

* Enable integration of RPAS (remotely-piloted aircraft systems) ensuring that safety and security risks are addressed
* Develop and exploit advanced manufacturing technologies with new industrial paradigms
* Harness the deployment of advanced IT capability and big data taking into account security challenges
* Ensure that the entire research and innovation chain is covered and supported by appropriate measures, financial, policy, regulatory, environmental and so on.

The challenging goals of Flightpath 2050 can only be delivered if all ACARE stakeholders work together to ensure that research and innovation through collaborative programs is undertaken on both European and national levels potentially supported also by international co-operation. However, given the multimodal aspects of the mobility challenge and the rapid developments and breakthroughs in other sectors like manufacturing or IT, ACARE also welcomes and fosters cooperation with other modes and sectors where this supports the achievement of our or societies goals.

**European Framework programs**

H2020 and the previous European framework programs have brought profound changes to the European aviation sector, setting an integrated European research strategy, fostering collaborations between all stakeholders, leading to operational networks and shared road-maps, and enabling large-scale ambitious programs. They pool resources to prepare the necessary basic scientific and technology knowledge and to demonstrate breakthrough technologies that many organisations would consider too risky to undertake on their own. They have been invaluable to support aviation research for the benefits of the citizen such as preserving the environment.

The Clean Sky JTI has been very effective in bringing together a critical mass of relevant companies, research organisations, academia and SMEs in addressing the most important industry needs as well as leveraging additional private funding in a coordinated way. The Clean Sky JU has been particularly good at disseminating information and successful in involving smaller organisations and European regions. Clean Sky could encourage participants to bring a higher level of innovative approach. However, there is no simple solution to make aviation fully sustainable within a couple of years. This will require long term research and development activities (>20 years) with a considerable financial backing.

The SESAR Joint Undertaking coordinates and concentrates the ATM R&D initiative of the entire spectrum of the European aviation community. While it improved its efficiency with respect to FP7, the transition to the Horizon 2020 participant portal, which was designed as a simplification measure for H2020, resulted in significant changes to the financial and legal framework and led to technical glitches for the SESAR JU. The introduction by the SESAR JU of the multi-annual work program that describes the program structure and contains detailed project descriptions significantly improved the efficiency. The quality of the research undertaken by SESAR is well regarded.

Set against the backdrop of growing international competition, the European aviation sector must continue to innovate to maintain its position as a world leader. H2020 and its associated PPPs provide the stimulus to meet this challenge. In doing so, **the whole research chain for aviation from lower to higher TRL, including top-down as well as bottom-up research must be maintained for the next framework program Horizon Europe**.

ACARE actively supports co-operation with other modes or sectors to create synergies and momentum in cross-cutting topics like multi-modality, manufacturing, IT, safety and security, environment, or alternative fuels. However, this will not suffice to achieve flightpath 2050 goals, as they require significant progress on aviation-specific topics and technologies as well. So there clearly is a need for aviation-specific as well as cross-modal and cross-sectoral research.

1. Reference: Sky and Space Intergroup of the European Parliament (SSI) [↑](#footnote-ref-1)