



Policy Brief: Electrifying Air Travel

Executive Summary

The aviation industry is responsible for 12% of carbon dioxide emissions from transport. Decarbonising aviation is therefore a vital part of achieving net zero. But the pace of change required and the complexity of technical challenge means this won't happen in time without collaboration underpinned by government support nationally and internationally.

Hybrid and 'all electric' aircraft technologies offer a pathway to net zero. Generating, distributing and utilising electric power for both on-board systems and propulsion will greatly improve the efficiency of future aircraft, and therefore substantially reduce their environmental impact.

Aircraft electrification is therefore critical to meet climate objectives. But there are significant technical hurdles to achieving net zero. Overcoming the technical challenges is not something that can be achieved in isolation, which is why SAEL was formed.

Solutions for Aircraft Electrification Leadership (SAEL) is a world-class partnership of researchers, industrialists and regulators, led by the University of Nottingham and key partners. Together, we have defined a clear path from conventional to green aviation for policy makers.

There is a clear opportunity for the UK to lead this critical challenge given our expertise in this area. UK Government has invested in state-of-the-art UK Electric Aircraft Propulsion Test Facility (UK EAPF) for testing of electric propulsion systems at altitude and it is one of the highest capacity infrastructures of its kind in the world.

SAEL offers policymakers a guide to underpin a green aviation investment strategy by:

- mapping what the technical and regulatory challenges are,
- mapping out the sequential steps to solve them pointing up the innovation priorities,
- and highlighting where the research expertise to solve each step challenge lies.



Image source: Ben Neale on Unsplash



The aviation industry is responsible for

12%

of carbon dioxide emissions from transport.

Flightpath 2050 aims to reduce carbon dioxide emissions by

75%

and nitrogen oxide (NO_x) emissions by 90%, per passenger kilometre by 2050.



Introducing Solutions for Aircraft Electrification Leadership (SAEL)

SAEL has defined a framework to lead the shift from conventional to green aviation. The SAEL framework, organised around eight key themes, comprehensively maps the associated technical challenges and links them to the required enabling solutions.

It establishes the critical paths to sustainable aviation, and through a traffic light approach, identifies the research and regulatory priorities that need to be resolved urgently to make green flight a reality. SAEL brings all the strands of this complex challenge into one place, to help government and industry leaders make sense of it and potentially guide needed action.

SAEL offers policy makers:

- A global network of the brightest and best researchers to help you identify the right experts.
- A powerful tool/methodology to identify the critical challenges, to shape investment decisions, regulatory choices and innovation priorities.
- An analytical decision making framework to support the UK's Jet Zero ambitions.

SAEL's next priorities

SAEL's next priority is to set up project partnerships and create joint international R&D projects to accelerate development of the critical technology solutions required. The open-source nature of the partnership will encourage development of global cooperation across different sectors of aviation.

This calls to the core motivation of every leader in the world who wants to contribute to the future of a sustainable world - and become an integral part of the solution. We are keen to work with government and other policy leaders to ensure the regulatory and policy framework is primed for success, and that the UK is able to play a leading role in moving to net zero aviation.

Key messages

- International collaboration is key to achieving net zero aviation. Through SAEL, UK-based academia and industry is helping to lead the way and this creates an opportunity for UK policy makers.
- Government leadership is needed to anticipate regulatory requirements and support further technological development and industrial strategy.



SAEL's framework provides a clear structure to help government understand the regulatory and technological challenges to achieving green aviation. We urge policy makers to build on this framework to achieve the vision set by Jet Zero, and ensure the UK leads in

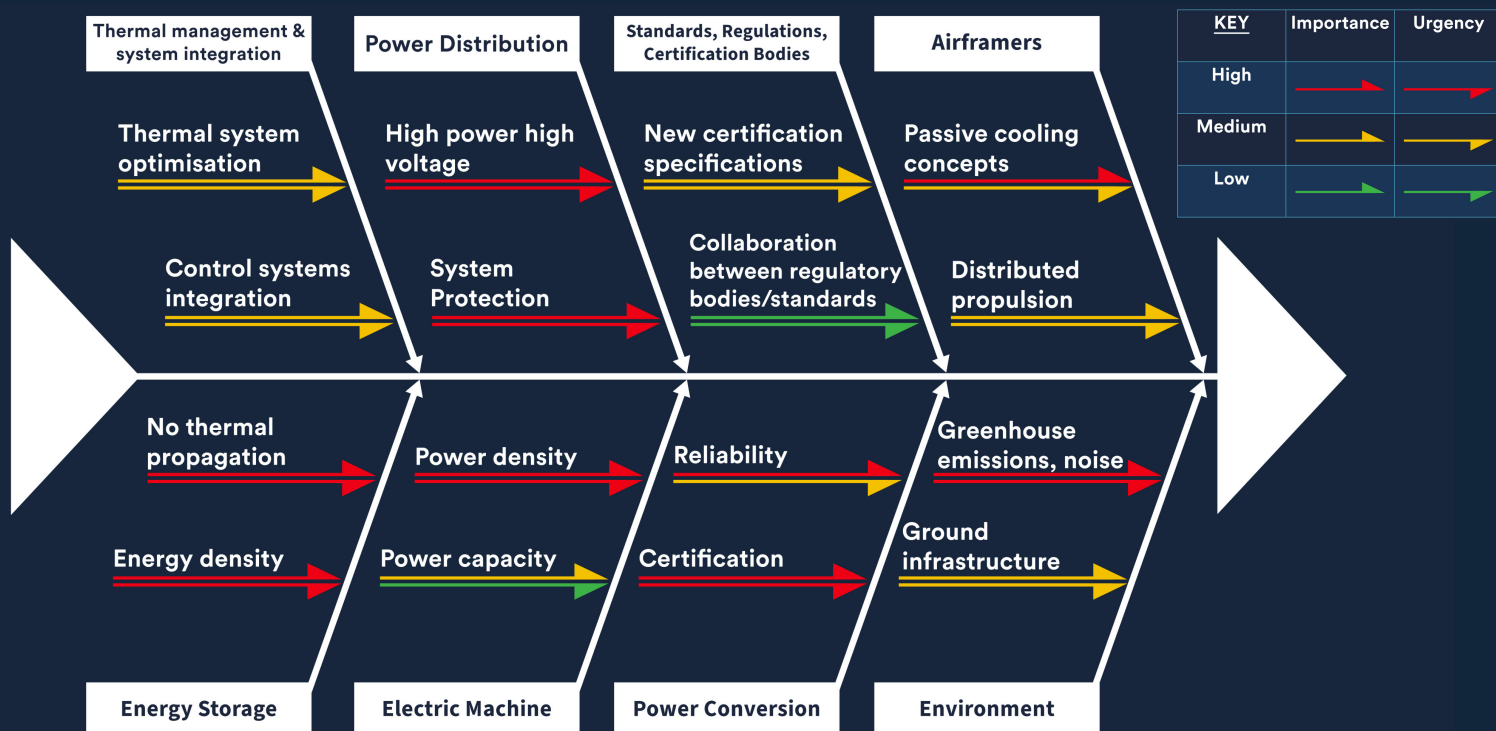


Figure 1: the SAEL pathway to green aviation. A full version, including detail on technical challenges and solutions, is available on request.



Policy context

Conventional aviation is responsible for 12% of CO2 emissions from transport. The government's new Jet Zero taskforce aims to achieve net zero in UK aviation by 2050 with 22% of all jet fuel to go green by 2040. Europe has also committed to reducing CO2 emissions by 75% per passenger kilometre in their Flightpath 2050 strategy.

To achieve these aims, radical transformation in aviation technology is needed which will involve rapidly overcoming a series of technological challenges. Aircraft systems are complex, each component has to work as a whole and therefore the technological solutions required must be developed in a comprehensive and holistic way.

Without the necessary coordination, we risk developing incompatible technologies, and a disconnect in the policy landscape for the regulatory and safety considerations required for this technological advancement. There is a need for international cooperation that brings together key stakeholders, including industry, research and governments, requiring strong leadership to push this agenda forward. The UK is well positioned to lead on this as a clean energy superpower, with its status as a global aviation hub and our world leading research in sustainable aviation.

We look forward to engaging further with you and discuss how SAEL can support you in achieving the crucial goal of net zero aviation.

Policy recommendations

We ask policymakers to:

1. use SAEL to shape a global and national green aviation strategy and help guide domestic research investment – building areas of strength and focussing on those technologies that will green aviation most quickly – and to drive global collaboration.
2. use access to the UK EAPF as an incentive for attracting investment in the UK to drive jobs and growth in the development and testing of the future aircraft systems.
3. support international collaboration on commercialisable research
4. establish government incentives to encourage industry to accelerate uptake of key technologies.



Image source: University of Nottingham image library



Tackling climate change thus demands a radical transformation of aviation technology.



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Contact the academic



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To learn more about Dr Sumsurooah's impactful research, please visit her [LinkedIn](#) page



About the University of Nottingham

Ranked 18th in the UK by the QS World University Rankings 2023, the University of Nottingham is a founding member of Russell Group of research-intensive universities. With our campuses in China and Malaysia we are part of a global network of education, research and industrial engagement. The University is among the best universities in the UK for research, positioned seventh for research power in REF 2021. The birthplace of discoveries such as MRI and ibuprofen, our innovations transform lives and tackle global problems.

The University of Nottingham is host to a range of research looking at the urgent challenges of net zero. Our Power Electronics and Machines Centre (PEMC), Zero Carbon Innovation Centre and Energy Institute are just a few examples of how we drive innovative technical solutions to reduce carbon emissions, improve energy efficiency and decarbonise industries.

The university's Institute for Policy and Engagement connects Nottingham's world-leading researchers with the public and policymakers to share insight and solve problems. We work with academic experts from across the university who want to create real impact by providing training, advice and expertise. Through these partnerships we will tackle together the most compelling challenges locally, nationally and globally.

This policy paper was supported by the Institute for Policy and Public Engagement. Find out more via our website nott.ac.uk/IPE or get in touch: theinstitute@nottingham.ac.uk



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