



SUSTAINABLE AVIATION

NET ZERO CARBON ROAD-MAP

ONE YEAR ON:
PROGRESS REPORT



SUSTAINABLE AVIATION
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FOREWORD

BY SUSTAINABLE AVIATION CHAIR

In April 2023 the UK aviation industry published its latest [Net Zero Carbon Road-Map](#), demonstrating the latest pathway to net zero carbon UK aviation by 2050.

In 2020 the UK became the first national aviation sector in the world to commit to reaching net zero by 2050 and to publish a detailed plan to get there. A year ago in 2023 we published our latest Net Zero Carbon Road-Map. Starting this year, we plan to report annually on progress against our Road-Map.

International air travel enables some of the most positive things we do as humans: connecting, cooperating, exploring and trading. For an island trading nation, aviation is vital to link us to the world, connecting UK businesses to global markets, enabling millions of us to visit families and friends overseas and to discover the world. We will only protect those benefits for this future if we take the carbon out of flying.

Our Road-Map last year showed that that is possible. To succeed we will need to: fly ever more efficient planes through modernised airspace; produce and use sustainable aviation fuels (SAF); develop zero-emission flight technologies, particularly hydrogen powered aircraft; and use carbon removal technologies to capture residual emissions that we cannot otherwise eliminate. The Road-Map reflected our growing confidence not only that net zero aviation is achievable, but that these technologies will offer significant economic opportunities for UK plc.

In this Progress Report we set out our emissions compared to our projections, summarise key industry activity and set out our view of progress on the key policies we need from the Government.

Our total emissions in 2023 were 34 million tonnes, broadly in line with our projections. They are lower than they were in 2005 even though passenger numbers have increased by over 20% since then. Per passenger, emissions were 25% lower than they were in 2005. This is a huge improvement, due to the roll out of newer, more efficient aircraft and engines and to some modernisation of airspace.

However, efficiencies alone will not take the carbon out of flying. That is why it has been so exciting over the last year to see real-world progress on the two other key in-sector measures: SAF and hydrogen.

In November 2023, Virgin Atlantic flew the first transatlantic flight on 100% Sustainable Aviation Fuel, showing that if we can produce SAF, airlines can and will fly it. And we are starting to produce it: 0.75% of all UK jet fuel in 2023 was SAF, much of that incentivised by Heathrow's innovative landing charge financial incentive. The Government has also confirmed its SAF mandate target of 10% SAF by 2030, six years from now. The last year has also seen hydrogen-powered aircraft regularly undertaking test flights over the UK countryside and airports like Bristol start to test the procedures for hydrogen in a live operational environment.

Scaling up these technologies needs the right Government policies, introduced with urgency and purpose. There too, things are moving, but we must maintain momentum.

Airspace modernisation should be low-hanging fruit, but it is still moving too slowly and Sustainable Aviation's recommendation for modernisation to be complete by 2030 is at risk. We need real focus and determination from Government to see the job through.



The Government launched a consultation on the “Revenue Certainty Mechanism” that is so vital to attract SAF plants and green jobs to the UK, and to avoid a future dependent on scarce, expensive and insecure imports. That is welcome news. But we are in a global race to attract investment, a race that the US and EU are currently winning. We must move quickly to get the mechanism into law as well as to prioritise waste to make SAF rather than burning it to make electricity.

The Government committed ongoing funding to the Aerospace Technology Institute to develop new zero emissions planes as well as more efficient conventional one. That is a very positive step. We now need the CAA to resource up to support the regulation of new planes, and we need aviation’s needs properly built into the UK’s emerging hydrogen strategy.

And all paths to decarbonise aviation will need significantly more low- and zero-carbon electricity – again, those needs must be built into national plans.

We have significant reasons to be optimistic about aviation’s sustainable future. We know the technologies that will get us there – and we are starting to see them be developed and rolled out. The industry is committed to take action and to invest. And we are committed to work in partnership where only Government market signals can unlock action and investment. Our challenge now is to scale up, at speed.

**Matt Gorman, Chair
Sustainable Aviation**



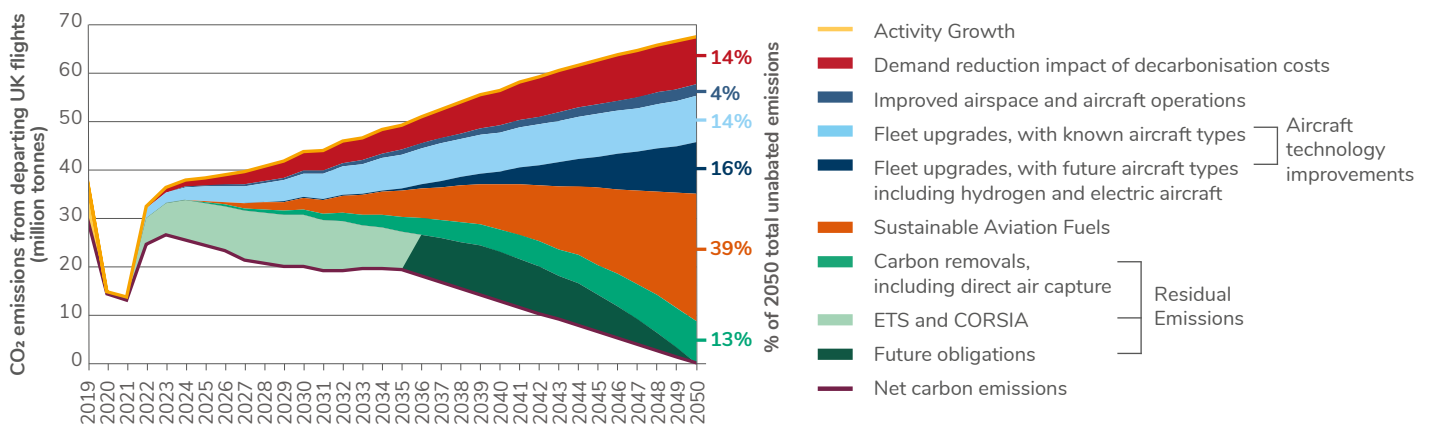
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1. THE SUSTAINABLE AVIATION DECARBONISATION ROAD-MAP SUMMARY

In April 2023 Sustainable Aviation published an updated Decarbonisation Road-Map setting out how the UK aviation industry can deliver net zero carbon emissions by 2050. It highlights the vital role and potential for SAF and zero carbon emission technologies such as hydrogen powered aircraft, alongside carbon removal technologies and the immediate advances being made in modernising airspace to help UK aviation reach net zero by 2050.



Three key measures account for aviation’s journey to net zero between 2019 to 2050. The role each measure contributes changes year by year, and over this period would deliver the following, cumulative carbon savings:

1. 302 MtCO₂ saved by burning less fuel due to better air traffic management and operating procedures and the introduction of known and new, more efficient and zero carbon emissions aircraft.
2. 240 MtCO₂ saved by moving from fossil fuel to sustainable aviation fuel.
3. 345 MtCO₂ saved through investment in permanent carbon removals and compliance with carbon trading and offsetting schemes.

The remaining 167 MtCO₂ will be reduced through slightly lower growth due to the decarbonisation cost impact on passenger demand, for example through the higher cost of SAF and compliance with carbon trading and offsetting schemes.

The Road-Map showed that the UK will be able to accommodate significant growth in passengers through to 2050 whilst reducing emission levels from just under 40 million tonnes of CO₂ down to zero - supporting many new jobs in the UK renewable and low carbon economy.

Economic opportunity

Analysis undertaken for our Road-Map showed that 10,000 new jobs could be created in a UK SAF industry by 2030, across our former industrial heartlands, rising to 60,000 jobs and £10bn of GVA by 2050. A homegrown UK SAF industry would deliver stable energy supply, making the UK less susceptible to the volatility of global markets.

UK aerospace’s economic contribution could increase from £8.4bn today to over £37bn by 2050. The UK aerospace industry’s co-investment approach with Government will be key to realising this with the co-benefit of maintaining the UK’s sovereign aerospace capability.

Further economic value and jobs are expected to be supported by aviation’s investment in carbon removals as well as supporting demand for renewable energy and hydrogen supply across the UK.

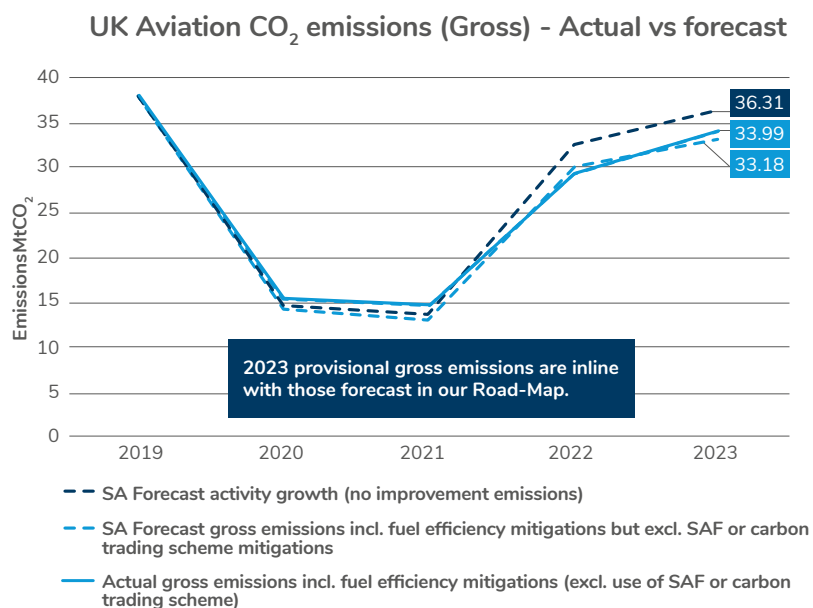
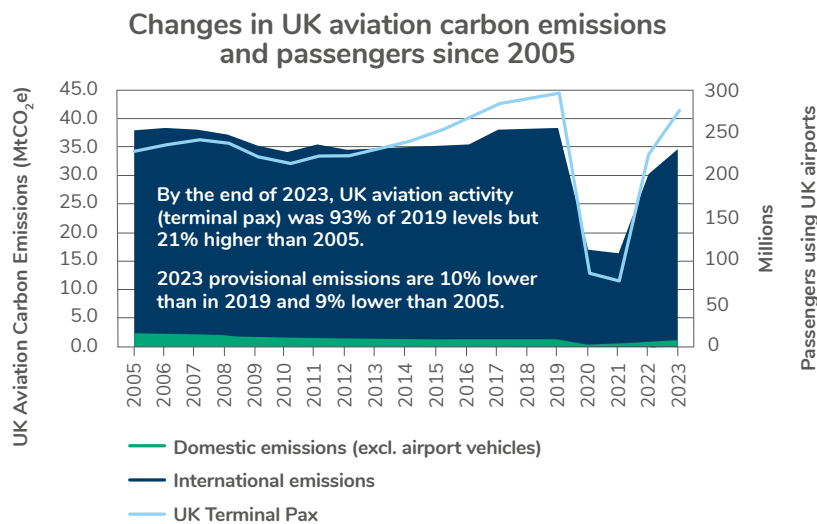


2. INDUSTRY PROGRESS

One year on from publication of our 2023 Road-Map the industry has recovered to almost pre-covid levels of activity, delivering this whilst continuing to reduce our carbon output. These charts show the latest position and how closely we are tracking our forecasted plan, showing the gross carbon emissions position. The tables below show the gross emissions position.

This progress report focuses on absolute emissions for 2023, based on the latest Government emissions data. Sustainable Aviation’s Net Zero Road-Map ultimately targets net zero emissions. Tracking net reductions on an annual basis is not straightforward as it relies on reviewing information on airline participation in the UK Emissions Trading System, the EU Emissions Trading System and the global ICAO “Carbon Offsetting and Reduction Scheme for International Aviation”. We have not been able to complete that work by the publication of this report but we plan to undertake further work in order to estimate net residual emissions annually in future. We do report the total SAF uplifted in 2023 as a percentage of total UK jet fuel uplift, which was 0.74% based on provisional Department for Transport data.

Emission performance



NOTE: Data uses published UK Government greenhouse gas emissions and aviation statistics. 2023 figures are provisional.



2. INDUSTRY PROGRESS

Key industry events since the 2023 decarbonisation Road-Map publication:

SAF

- In April 2023, the Royal Air Force successfully completed a Voyager air-to-air refuelling flight, powered by an approximately 43% blend of Sustainable Aviation Fuel (SAF)¹. The SAF for the flight was sourced by International Airlines Group (IAG), and supplied by bp.
- In November 2023 Virgin Atlantic undertook a world first net zero flight² by a commercial airline across the Atlantic using 100% sustainable aviation fuel. Virgin Atlantic's historic flight on 100% Sustainable Aviation Fuel (SAF) takes off from London Heathrow to New York JFK today, demonstrating the capability of SAF as a safe drop-in replacement for fossil derived jet fuel, compatible with today's engines, airframes, and fuel infrastructure. Milestone made possible through collaboration by a Virgin Atlantic-led consortium, including Boeing, Rolls-Royce, Imperial College London, University of Sheffield, ICF and Rocky Mountain Institute, in partnership with Department for Transport.
- Airlines including IAG and Jet2 signed agreements for the large-scale global purchase of Sustainable Aviation Fuel, with Jet2 announced a major investment into a new the Fulcrum NorthPoint facility, being developed by Fulcrum BioEnergy Ltd in the North West of England. Production of SAF is expected to commence at the plant in 2027.
- Heathrow's pioneering SAF Incentive Programme has incentivised the use of SAF at the airport, approximately halving the price gap between conventional jet fuel and SAF. This year, there is £71 million available to airlines through the incentive, targeting up to 2.5% of the fuel used at Heathrow.
- In December 2023 Alfanar awarded Air Liquide Engineering & Construction an engineering package to support the development of the Lighthouse plant³, one of the first projects underway in the UK aiming to convert biogenic and non-biogenic solid wastes and residues into sustainable aviation fuels (SAF) on a large scale.

Zero Emission Flight

- In September 2023 a group including easyJet, Rolls-Royce, Airbus, Ørsted, GKN Aerospace and Bristol Airport launched the Hydrogen in Aviation (HIA) alliance working to accelerate the delivery of zero carbon aviation by mapping out the milestones to ensure infrastructure, regulatory and policy changes keep pace with the ground-breaking technological developments in carbon-free flying.

¹ <https://www.gov.uk/government/news/raf-voyager-refuels-mid-air-with-sustainable-aviation-fuel>

² <https://corporate.virginatlantic.com/gb/en/media/press-releases/worlds-first-sustainable-aviation-fuel-flight.html>

- Rolls-Royce and easyJet achieved the world's first run of a modern aircraft engine on hydrogen, running on 100% hydrogen and proving the fuel can be combusted at conditions that represent maximum take-off thrust. The latest set of tests, to prove aerospace cryogenic liquid hydrogen pump systems, have begun at Rolls-Royce's facility at Solihull, UK.
- Airbus is preparing next generation fuel systems to run on hydrogen and new SAFs thanks to its ZEROe Development Centre in Filton, dedicated to new fuels testing.
- ZeroAvia successfully completed its initial Dornier 228 Flight Test Campaign⁴, having flown its hydrogen-powered Dornier 228 testbed airplane 10 times in 2023, and is now preparing for its first cross-country flights. ZeroAvia retrofitted the 19-seat twin turboprop with a prototype of its 600-kilowatt ZA600 powertrain, which uses hydrogen fuel cells to generate electricity.
- NEBOair Ltd formed key partnerships with Moray Flying Club at RAF Lossiemouth, SaxonAir Training at Norwich Airport, and Airbourne Aviation Limited at Popham Airfield focussed on reducing the carbon footprint of pilot training by utilising the Velis Electro.

Airspace modernisation

- The UK Airspace Modernisation Strategy has been developed at the same time as the Road-Map launch, involving the simultaneous deployment of a systemised route network from 7,000 feet to 24,500 feet, as well as Free Route Airspace (FRA) above 24,500 feet. The FRA deployment over the west of England is expected to deliver annual savings of over 12,000 tonnes of CO₂ emissions in UK airspace.
- The 'once in a generation' redesign of the Western, London, Scottish and Manchester terminal airspace areas continues. In Oceanic airspace, the introduction of 'Sustainability Tracks' has been tested in collaboration with partners NAVCANADA, FAA, IATA, airline customers, and industry experts. The sustainability tracks are designed to take account of the most fuel-efficient profiles for key city pairings transiting Europe and North America.

Carbon removals

- easyJet became the first airline in the world to sign a contract with Airbus for its carbon-removal initiative. Available through the Airbus Carbon Capture Offer, the technology uses Direct Air Carbon Capture and Storage (DACCS), to offer airlines worldwide carbon removal credits to advance their decarbonisation goals.

See annex for relevant SA member progress announcements between May 2023 and April 2024 for more information.

³ <https://biofuels-news.com/news/alfanar-awards-air-liquide-saf-contract/>

⁴ <https://www.futureflight.aero/news-article/2023-07-21/zeroavia-concludes-first-flight-test-campaign-hydrogen-powered-dornier-228>



3. CURRENT STATUS

Progress is being made – but acceleration is needed

The year following the publication of our Net Zero Road-Map has been one of exciting industry progress, particularly in demonstrating the credibility of critical technological pathways within the Road-Map. Key moments have included a transatlantic commercial flight from the UK powered by 100% sustainable aviation fuel, and multiple test flights of aircraft powered by hydrogen in the skies above Britain.

One year on from publication of our latest Road-Map, we have assessed progress across our technology development journey and policy priorities, giving it a green, amber, or red rating in the table below:

Net 0 Carbon Road-Map Recommendation	Current Status	Actions Required
<p>Maximise short-term operational efficiencies by accelerating the UK airspace modernisation programme.</p>	<p>Government is working on delivering airspace modernisation in partnership with industry, the Airspace Change Organising Group (ACOG) on the coordinated implementation plan for airspace changes in the UK and the CAA through its refreshed Airspace Modernisation Strategy, which reaffirms the Government’s commitment to delivering this key infrastructure programme.</p>	<p>Industry is concerned over the pace of delivery for airspace modernisation, which we recommended in our Road-Map last year should be complete by the end of this decade. Pace is currently dictated by the need to coordinate proposals for arrival/departure routes and the network across multiple sponsors, and by the complex requirements for consultation in line with CAA processes. Speed is, however, critical – Government needs to accelerate the timeline for implementation of the Single Design Entity as the authority overseeing the whole programme, to drive faster progress.</p>
<p>Delivering commercial UK Sustainable Aviation Fuel production at scale this decade by providing a revenue certainty mechanism for SAF to deliver at least five UK SAF plants under construction by 2025.</p>	<p>In April the government confirmed⁵ target to ensure 10% of all jet fuel in flights taking off from the UK comes from sustainable sources by 2030 through its Sustainable aviation fuel mandate. Subject to parliamentary approval the mandate will come into effect in January 2025.</p> <p>More needs to be done to ensure aviation has a fair share of UK sustainable feedstocks for planned ‘2nd Generation’ advanced SAFs by amending the DEFRA waste hierarchy to prioritise SAF as an energy recovery pathway for waste. Feedstock access also applies to the production of hydrogen as feedstock to Power-to-Liquid SAFs and as a direct fuel, and GGR policy which must include in scope the utilisation of captured CO₂ as a feedstock for SAF.</p>	<p>The Government needs to ensure the mandate is legislated in accordance with this timeline, and comes into effect in January 2025. It should also reduce the cost of available SAF in the UK to bring it closer to the cost of jet fuel, with support at least in proportion to that being provided to EU airlines by the European Union.</p> <p>The DEFRA waste hierarchy should be amended to prioritise SAF over Energy-from-Waste, reflecting the carbon savings of SAF over EfW. This would help secure non-recyclable municipal solid waste (MSW) as a feedstock for 2G SAF, as waste authorities would follow the hierarchy when disposing of MSW. Defra has given councils the green light to send the waste they collect to make SAF, with many disposal contracts due for renewal in the coming months and years.</p>

⁵ <https://assets.publishing.service.gov.uk/media/662938db3b0122a378a7e722/creating-the-UK-saf-mandate-consultation-response.pdf>



3. CURRENT STATUS

Progress is being made – but acceleration is needed (continued)

Net 0 Carbon Road-Map Recommendation	Current Status	Actions Required
<p>Delivering commercial UK Sustainable Aviation Fuel production at scale this decade by providing a revenue certainty mechanism for SAF to deliver at least five UK SAF plants under construction by 2025.</p>	<p>In April 2024 the Government launched a consultation⁶ on the implementation of a revenue certainty mechanism.</p>	<p>More urgent progress is needed to complete the consultation and implement a government-backed revenue certainty mechanism to deliver at least five commercial scale SAF plants under construction by 2025. The current timeline for implementation - Q4 2026 - is not aligned with the target of plants in construction by 2025, without bridging support for UK projects.</p>
<p>Invest in Zero Emissions flight technology alongside investing in UK hydrogen supply and airport infrastructure.</p>	<p>The Government has commitment to extend the ATI's funding, with an additional £975 million from 2026 to 2030. Combined with industry co-funding, this will amount to nearly £2 billion of additional investment in sustainable aerospace research and technology.</p>	<p>The Government should now commit to extend their support to to a ten-year long-term R&D support to 2035 through the ATI programme, to drive further development of lower noise, ultra-efficient and Zero Emission Flight technologies.</p>
	<p>The Government is focused on hydrogen demand and production at a national level and is starting to consider aviation's needs as part of that plan. To date airport projects are largely small scale trials. We welcome the work of the Jet Zero Council Zero Emission Flight Delivery Group which has been active in addressing these challenges of developing and commercialising zero carbon emission technologies, including through detailed action plans.</p>	<p>Further steps are required to support scale-up and commercialisation of zero emission technologies and the infrastructure needed to support them, over the long-term. We are also calling for an industrial plan on how to deliver zero carbon emission aviation, with a clear lead department within government, a coordinated plan and a commitment from all stakeholders to work together.</p>
<p>Address residual aviation emissions by accelerating the role out of carbon removals, including them in the UK emissions trading scheme (ETS) and ensuring aviation's fair share.</p>	<p>Sustainable Aviation has established a cross industry working group to explore the potential for an advanced market signal that will help the carbon removal industry scale-up.</p> <p>The Government has set out a clear ambition for carbon capture, utilisation and storage (CCUS) in the UK via the UK's CCUS Net Zero Investment Roadmap.</p>	<p>Sustainable Aviation will complete our proposal for an advanced market signal by Summer 2024.</p> <p>UK Government must develop a clear carbon removal policy for aviation that secures access to our fair share of the UK CCUS planned capacity.</p> <p>In partnership, industry and Government must continue to evolve proposals to scale CCUS in the UK and ensure this effort is bankable through the UK ETS and other carbon trading schemes.</p>

See expanded table in annex for a more detail. In summary, whilst the policy environment is moving forwards, it is not yet doing so quickly enough across each of the key areas we identified in our Road-Map, with much progress assessed as being 'amber', where policy is either yet to be decided, fully implemented, or completed.

⁶ <https://assets.publishing.service.gov.uk/media/66295022b0ace32985a7e802/sustainable-aviation-fuels-revenue-certainty-mechanism.pdf>



4. NEXT STEPS

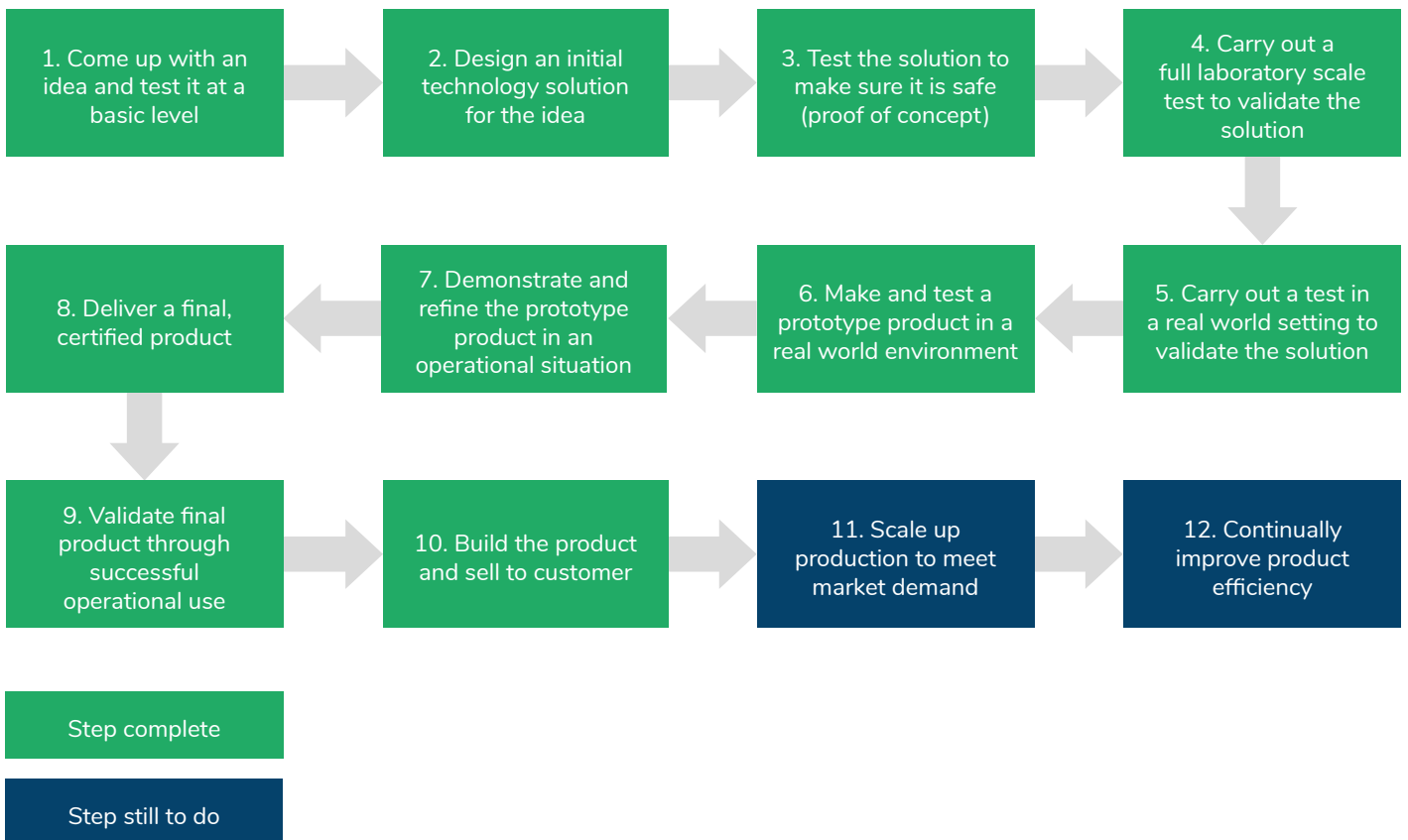
Decarbonising aviation requires the delivery of multiple, interdependent low and zero carbon technological pathways, many of which are at varying stages of development and commercialisation - see tables below detailed the development journey of SAF and Zero Carbon Emission technologies. Critically, all pathways are necessary, and need ongoing political and policy support.

As is evident from the assessment table real progress across the various elements of the Road-Map has been made over the past year, particularly around the commitment to and implementation of policies to support SAF production and commercialisation, to fund aerospace R&D and continue to progress airspace modernisation.

Nonetheless, given the pace of progress needed to deliver the carbon reductions required, and to maximise the economic opportunities for the UK in a competitive global market, further acceleration, and policy certainty in several key areas is needed. Particularly, to deliver a government-backed revenue certainty mechanism to enable UK sustainable aviation fuel production here in the UK, as well as further action to support the infrastructure needed to commercialise and zero carbon emission flight.

Key development steps for SAF and Zero Carbon Emission technologies

SAF development steps

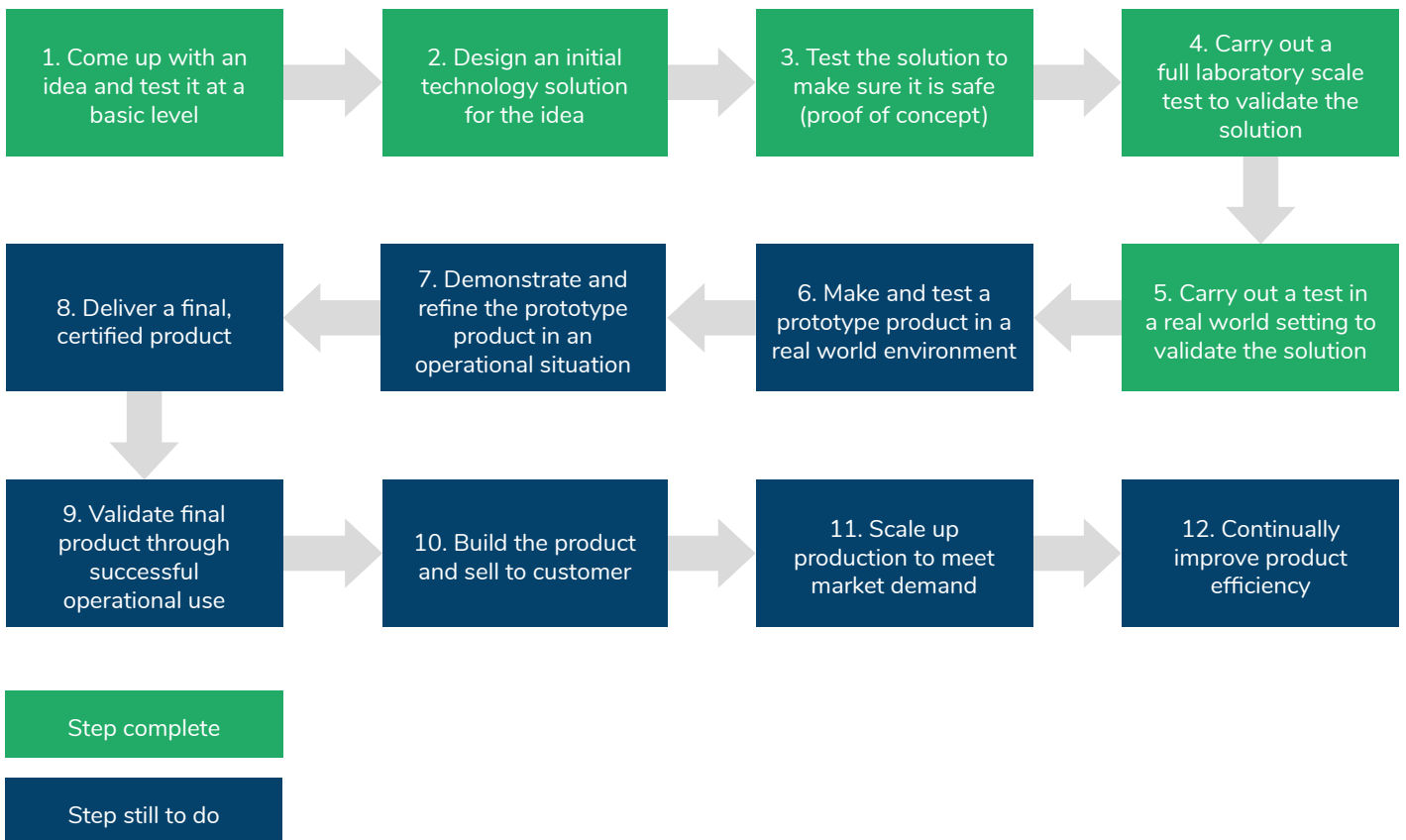




4. NEXT STEPS

Key development steps for SAF and Zero Carbon Emission technologies (continued)

ZEF development steps



The flow diagram above show the strategic steps and status to deliver the key developments for SAF and ZEF to enable the aviation industry to meet its 2050 net zero carbon commitment. Successfully delivering on these steps will avoid the risks set out below.



4. NEXT STEPS

Risks to Road-Map delivery

To avoid the risks of not achieving our net zero carbon Road-Map target by 2050, and maximise the economic benefits, and pace of, UK aviation decarbonisation, action is needed to address important, current issues including:

The SAF mandate - cost implications

We welcome the confirmation of the UK's ambitious SAF mandate as an important tool to incentivise uptake of and commercialise SAF usage in the UK. The Road-Map makes a number of assumptions on mandate design, costs and access to feedstocks. Recent industry analysis shows that due to near-term competition amongst mandated UK suppliers for a finite global supply of non-HEFA SAF, there is a risk that the UK mandate could, without further policy support, particularly to deliver UK-supply of advanced non HEFA SAF by the end of this decade, could result in widespread use of 'buy-outs' by suppliers (who pay a fee to 'buy-out' of their obligation to supply SAF to the market).

High levels of buy-outs would result in significantly higher SAF costs for UK aviation consumers, compared to travellers from the US or Europe, or other parts of the world where mandates do not exist. Such a scenario could result in substantial relative increases in fuel costs for airlines operating from the UK compared to our EU and US counterparts (and Road-Map assumptions), resulting in ticket price rises for consumers beyond those assumed within the Road-Map. The new mandate - including its buy-out price and HEFA cap - must be kept under review so that the UK stays competitive as a global aviation leader. Government must also act quickly to complete its consultation on a revenue certainty scheme that will accelerate domestic SAF production and make compliance with the mandate easier.

Net Zero Carbon Emission Flight

Turning to zero-emission flight, beyond ATI R&D funding, further steps are now required to support scale-up and commercialisation of zero emission technologies and the infrastructure needed to support them. For example, currently there are no major projects underway at commercial airports with Government support to target hydrogen production or refuelling infrastructure, necessary to support early adoption of hydrogen propulsion systems. Longer-term, a lack of strategic plan to ensure sufficient renewable power and green hydrogen production capability to secure aviation's fair share amongst other parts of the economy will impact prospects for both hydrogen as a fuel and feedstock for direct synthetic SAF.

We welcome the work of the Jet Zero Council Zero Emission Flight Delivery Group which since its establishment has been active in addressing these challenges of developing and commercialising zero carbon emission technologies, including through detailed action plans. We are, separately, calling for an industrial plan on how to deliver zero carbon emission aviation, with a clear lead department within government, a coordinated plan and a commitment from all the stakeholders to work together including the Department for Business and Trade, the Department for Energy Security and Net Zero, the Department for Transport and His Majesty's Treasury and the regulators (the CAA and HSE) to work in unity.

Airspace Modernisation

On airspace our Road-map assumed we would complete airspace modernisation in the UK by 2030, delivering around a 5% emissions reduction. This is dependent on completing a series of airport specific airspace change programmes. Progress on this is currently struggling. Beyond the UK, further emission savings are assumed from airspace modernisation programmes across Europe and other parts of the world. These programmes offer the potential to deliver greater savings than anticipated within UK airspace, but they are also struggling with progress. Given fuel savings from more efficient operations give us an immediate benefit, it is imperative that industry and Government continue to work closely to identify solutions to current barriers and implement them as soon as possible.

Carbon Removals

Sustainable Aviation's Road-Map has set out the vision for aviation to invest in 8.8 Mt of permanent carbon removals by 2050. This represents a significant market investment potential by aviation and the industry is making progress globally. An example includes the Airbus and easyJet contract for carbon removal signed in October 2023⁷. The UK has an excellent potential to benefit from this aviation investment to scale up already identified nature based and engineered carbon removal capacity. Two barriers exist to realising this. Firstly, a joined-up Government policy on carbon removals aligned with its net zero and jet zero strategies. Secondly urgent progress is required on adapting current emission trading policies, to recognise investment by airlines in carbon removals as a verified carbon reduction credit.

⁷ See <https://aircraft.airbus.com/en/newsroom/press-releases/2023-10-easyjet-signs-up-to-airbus-pioneering-carbon-removal-solution>



5. CONCLUSIONS

One year on from the Road-Map launch, the UK is competing in a global race to capture the private investment that will drive development of the technologies to power net zero and create the jobs of the future. The US Inflation Reduction Act is in full effect, which includes hundreds of billions of dollars in incentives for low-carbon technologies including SAF and hydrogen production, and the EU has agreed to distribute billions of euros in carbon allowances to help subsidise the higher cost of SAF for its airlines.

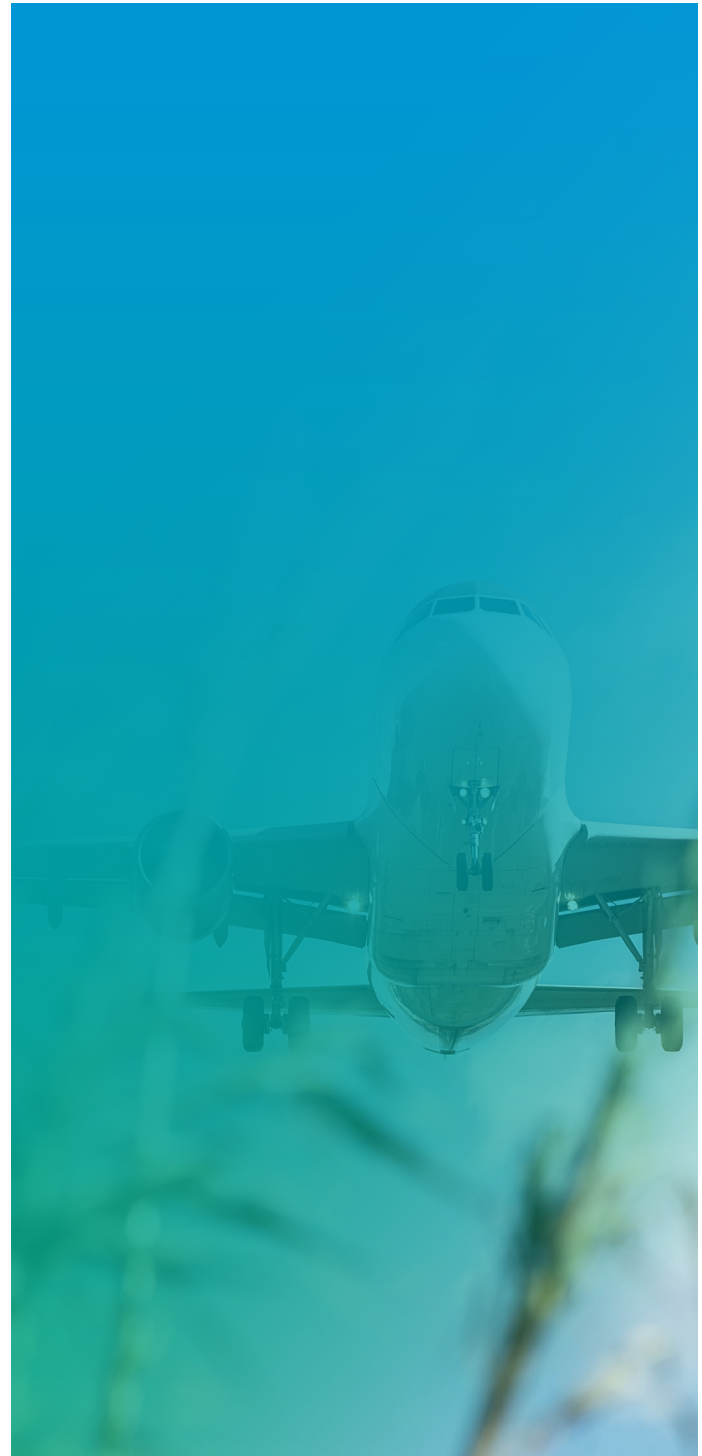
Here in the UK, driven by ongoing industry action alongside and the work of the UK government in partnership with industry through bodies like the Jet Zero Council and ATI, there have been several important developments within the UK and international policy landscape since the publication of Road-Map in April 2023 and are aligned with its policy recommendations - see progress table in section 3.

However, acceleration and further support is needed for success

This one-year-on report and our recently published [Manifesto for UK Leadership in Sustainable Aviation](#)⁸ set out the key areas of action required to ensure the delivery of net-zero carbon aviation remains on track. In this critical year the aviation industry is calling on the following actions to ensure the vision set out in our Road-Map remains on track for delivery:

Deliver commercial UK Sustainable Aviation Fuel production at scale this decade

- Accelerate the timetable to deliver a government-backed SAF revenue certainty mechanism, by introducing primary legislation in the first King's Speech of the next parliament, to ensure commercial UK SAF production is delivered at scale.
- Use this as a catalyst to establish a pipeline of investment for SAF production, including the supply of '2nd Generation' advanced SAFs ahead of delivery of power-to-liquid SAF that will provide efficient sustainable fuel in the medium to long-term.
- Ensure aviation has a fair share of UK sustainable feedstocks for planned '2nd Generation' advanced SAFs by amending the DEFRA waste hierarchy to prioritise SAF as an energy recovery pathway for waste.
- Reduce the cost of available SAF in the UK to bring it closer to the cost of jet fuel, with support at least in proportion to that being provided to EU airlines by the European Union via Emissions Trading Scheme free allowances.



⁸ <https://www.sustainableaviation.co.uk/wp-content/uploads/2024/03/Sustainable-Aviation-Manifesto.pdf>



5. CONCLUSIONS

Strengthen the UK's position as a world-leading innovator of aerospace technologies that gives UK competitive advantage in aviation efficiency and the development and commercialisation of new technologies, including hydrogen

- Commit to uplifted, ten-year long-term R&D support to 2035 through the ATI programme to drive further development of lower noise, ultra-efficient and ZEF technologies.
- Ensure the investment and regulatory environments secure the UK's leading position on sustainable aviation power propulsion including hydrogen and sustainable fuel compatibility, to support scale-up, industrialisation and delivery of required infrastructure.
- Ensure the CAA is effectively resourced to lead on the development and certification of novel low and ZEF technologies including hydrogen to enable safe and timely entry-into-service, with a clear remit and direction from Government to support the sector deliver net-zero.
- Deliver an industrial plan on how to deliver hydrogen-powered aviation. To do this we need, a clear lead within government, a coordinated plan and objectives, and a commitment from all the stakeholders to work together.
- The Government should establish a National Hydrogen Academy by 2025.

Accelerate the airspace modernisation programme with Government support to remove obstacles to early completion

- Ensure industry input into a delivery programme that supports faster completion. Modernisation is the industry's most immediate means to reduce passenger delays, increase capacity, and deliver carbon and noise reduction targets.
- Encourage collective industry commitment with sustained Government support to foster close collaboration and realise early carbon benefits.
- Establish the Single Design Entity with clear governance and structure.

Progress longer-term objectives that will be critical to success of the Net Zero Aviation by 2050 by securing capacity to meet the required energy and carbon removals demand to deliver UK aviation's transition to net zero

- Align on a strategic plan to ensure the UK can generate the 150 - 200 extra TWh in renewable energy UK aviation will require to transition to net zero, including to produce electricity for sustainable fuel production such as producing hydrogen as both a feedstock for Power to Liquid SAF and a direct fuel. This includes ensuring a modernised UK electricity grid can deliver capacity and that Ofgem can approve National Grid to act proactively, rather than reactively, to deliver UK aviation's energy transition.
- Accelerate the rollout of carbon removal and carbon capture and storage technology to mitigate residual aviation carbon emissions, by including carbon removals the UK ETS scheme and ensuring aviation has access to a fair share alongside other sectors.

Whilst there is still some considerable work to do, continued and enhanced collaboration and coordination between industry, government and stakeholders should ensure we remain on course to deliver a net-zero carbon sector by 2050, as long as the actions are resolved in the required timeframe.



ANNEX





ANNEX

SA Member	Press Release Date	Announcement Summary	Link to press release
SA Council member announcements			
Airbus	18/03/2024	Hydrogen in Aviation Alliance Milestone Delivery Report	https://www.airbus.com/en/newsroom/press-releases/2024-03-hia-milestone-delivery-report-lists-critical-next-steps-for-uk-to
	21/02/2024	Airbus and Total Energies sign partnership for SAF	https://www.airbus.com/en/newsroom/press-releases/2024-02-airbus-and-totalenergies-sign-strategic-partnership-for-sustainable
	09/01/2024	ZeroE Development Centre opens	https://www.airbus.com/en/newsroom/press-releases/2024-01-airbus-opens-new-zeroe-development-center-in-stade-for-innovative-0
	28/11/2023	Terra Carta Seal 2023 Award	https://www.airbus.com/en/newsroom/stories/2023-11-airbus-awarded-the-sustainable-markets-initiatives-2023-terra-carta-seal
	05/09/2023	UK hydrogen alliance established to accelerate zero carbon aviation	https://www.airbus.com/en/newsroom/press-releases/2023-09-uk-hydrogen-alliance-established-to-accelerate-zero-carbon-aviation
Airlines UK	05/03/2024	Manifesto publication	https://airlinesuk.org/airlines-uk-2024-manifesto/
AOA	June 2023	AOA response to CCC's progress in reducing emission report	https://www.aoa.org.uk/aoas-response-to-the-cccs-progress-in-reducing-emissions-report/
British Airways/ IAG	11/04/2024	BA becomes the first UK airline to introduce two next generation real-time weather apps	https://mediacentre.britishairways.com/news/11042024/british-airways-becomes-the-first-uk-airline-to-introduce-two-next-generation-real-time-weather-apps
	28/02/2024	IAG reaches one-third of 2030 SAF Target	https://www.iairgroup.com/media/vt2m0ejr/iag-reaches-one-third-of-2030-saf-target-with-major-e-saf-deal-with-twelve.pdf
	20/12/2024	First of a kind pilot for financing carbon removals	https://mediacentre.britishairways.com/news/20122023/first-of-a-kind-pilot-for-financing-carbon-removals-launches-in-partnership-between-cur8-undo-british-airways-and-standard-chartered
	17/11/2023	UK moves close to aviation decarbonisation with project Speedbird	https://mediacentre.britishairways.com/news/17112023/uk-moves-a-step-closer-to-aviation-decarbonisation-as-british-airways-nova-pangaea-technologies-and-lanzajets-project-speedbird-wins-9m-government-funding?ref=News
	25/07/2023	IAG announces investment into Nova Pangaea Technologies to drive UK sourced SAF	https://www.iairgroup.com/media/3xnjbosl/iag-announces-investment-into-nova-pangaea-technologies.pdf



ANNEX

SA Member	Press Release Date	Announcement Summary	Link to press release
SA Council member announcements			
easyJet	12/04/2024	Announced successful hydrogen ground trial at Bristol Airport	https://www.bristolairport.co.uk/corporate/news-and-media/news-and-media-centre/2024/4/ground-breaking-bristol-airport-hydrogen-trial-next-critical-step-on-journey-to-achieving-zero-emission-aviation/
	09/10/2023	easyJet signs up to Airbus' pioneering carbon removal solution	https://www.airbus.com/en/newsroom/press-releases/2023-10-easyjet-signs-up-to-airbus-pioneering-carbon-removal-solution
Gatwick	27/02/2024	London Gatwick will cut its emissions from its diesel vehicles by 90% by swapping the fuel for Hydrotreated Vegetable Oil (HVO)	https://www.mediacentre.gatwickairport.com/news/london-gatwick-cuts-its-own-vehicle-scope-1-emissions-by-90-after-swapping-diesel-for-hydrotreated-vegetable-oil-04c5-40f32.html
	08/01/2024	London Gatwick becomes first international airport to open dedicated electric vehicle charging station	https://www.mediacentre.gatwickairport.com/news/london-gatwick-becomes-first-international-airport-to-open-dedicated-electric-vehicle-charging-station-electric-forecourt-r-c7ab-40f32.html
	24/10/2023	London Gatwick takes another step forward on road to net zero	https://www.mediacentre.gatwickairport.com/news/london-gatwick-takes-another-step-forward-on-road-to-net-zero-a85b-40f32.html
GKN	20/03/2024	GKN Aerospace Joins HyFIVE Consortium to Lead liquid hydrogen fuel system development for zero-emission aviation	https://www.gknaerospace.com/news-insights/news/gkn-aerospace-joins-hyfive-consortium-to-lead-liquid-hydrogen-fuel-system-development-for-zero-emission-aviation/
	10/01/2024	GKN Aerospace invests £50 million to grow world-leading sustainable additive fabrication capability	https://www.gknaerospace.com/news-insights/news/gkn-aerospace-invests-50-million-to-grow-world-leading-sustainable-additive-fabrication-capability/
	05/09/2023	UK Hydrogen Alliance established to accelerate zero carbon aviation and bring an £34bn annual benefit to the country	https://www.gknaerospace.com/news-insights/news/uk-hydrogen-alliance-established-to-accelerate-zero-carbon-aviation-and-bring-an-34bnstar-annual-benefit-to-the-country/
	15/08/2024	GKN Aerospace, Marshall and Parker Aerospace join forces to explore liquid hydrogen fuel systems for zero emission aircraft	https://www.gknaerospace.com/news-insights/news/gkn-aerospace-marshall-and-parker-aerospace-join-forces-to-explore-liquid-hydrogen-fuel-systems-for-zero-emission-aircraft/
	20/06/2024	GKN Aerospace is a key partner in two EU projects developing innovative solutions for ultra efficient aircraft engines	https://www.gknaerospace.com/news-insights/news/gkn-aerospace-is-a-key-partner-in-two-eu-projects-developing-innovative-solutions-for-ultra-efficient-aircraft-engines/



ANNEX

SA Member	Press Release Date	Announcement Summary	Link to press release
SA Council member announcements			
Heathrow	12/03/2024	Heathrow Launches renewable Biofuel breakfast to increase understanding of Sustainable Aviation Fuel (SAF)	https://mediacentre.heathrow.com/pressrelease/detail/19230
	23/11/2023	Carbon cutting fuel use grows	https://mediacentre.heathrow.com/pressrelease/detail/18327
	03/08/2024	Heathrow paving the way forward with lower carbon concrete trial	https://mediacentre.heathrow.com/pressrelease/detail/17360
MAG	08/03/2024	MAG publish ICF study on lifecycle assessment of SAF and electricity from municipal solid waste	https://mediacentre.magairports.com/make-saf-not-electricity-from-household-waste-urges-boss-of-uks-largest-airports-group/
NATS	20/02/2024	Taking Flight: progressing the path to modernise UK airspace	https://nats.aero/blog/2024/02/taking-flight-progressing-the-path-to-modernise-uk-airspace/
	06/02/2024	NATS receives A List acclaim for leadership in environmental transparency and action	https://www.nats.aero/news/nats-receives-a-list-acclaim-for-leadership-in-environmental-transparency-and-action/
Rolls-Royce	13/11/2023	100% SAF test programme successfully completed	https://www.rolls-royce.com/media/press-releases/2023/13-11-2023-poweroftrent-rr-successfully-completes-100-sustainable-aviation-fuel-test-programme.aspx
	13/11/2023	Successful run of UltraFan technology demonstrator to maximum power	https://www.rolls-royce.com/media/press-releases/2023/13-11-2023-rolls-royce-announces-successful-run-of-ultrafan-technology-demonstrator-to-maximum-power.aspx
	18/10/2023	Next step completed to decarbonating Business Aviation	https://www.rolls-royce.com/media/press-releases/2023/18-10-2023-business-aviation-rr-completes-next-step-on-its-journey-to-decarbonising.aspx
	27/09/2023	Successful first fuel burn for new engine for hybrid electric flight	https://www.rolls-royce.com/media/press-releases/2023/27-09-2023-new-rr-engine-for-hybrid-electric-flight-completes-successful-first-fuel-burn.aspx
Virgin Atlantic	28/11/2023	World's First 100% SAF Flight	https://corporate.virginatlantic.com/gb/en/media/press-releases/worlds-first-sustainable-aviation-fuel-flight.html



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SA Member	Press Release Date	Announcement Summary	Link to press release
SA member announcements			
AGS	09/02/2024	Glasgow Airport hydrogen hub to support zero-emission flight by 2027	https://www.glasgowairport.com/media-centre/2024/glasgow-airport-hydrogen-hub-to-support-zero-emission-flight-by-2027/
	27/11/2023	Glasgow - work on Scotland's largest airport based solar farm gets underway	https://www.glasgowairport.com/media-centre/2023/work-on-scotland-s-largest-airport-based-solar-farm-gets-underway/
	19/06/2023	Electrifying addition to fleet arrives at Aberdeen International Airport	https://www.aberdeenairport.com/about-us/media-centre/2023/electrifying-addition-to-fleet-arrives-at-aberdeen-international-airport/
	23/05/2023	A consortium including Glasgow Airport has secure funds to test feasibility of hydrogen production	https://www.glasgowairport.com/media-centre/2023/a-consortium-including-glasgow-airport-has-secured-funds-to-test-feasibility-of-hydrogen-production/
Birmingham Airport	25/03/2024	Birmingham Airport invests in westrak as part of sustainability strategy	https://www.birminghamairport.co.uk/media-information/news/2024/03/birmingham-airport-invests-in-webtrak-as-part-of-sustainability-strategy/
	25/08/2023	Solar panels will provide 20% on BHX's electricity by May 2024	https://www.birminghamairport.co.uk/media-information/news/2023/08/solar-panels-will-provide-20-of-bhx-s-electricity-by-may-2024/
	26/05/2023	Birmingham Airport and ZeroAvia explore plans for renewable hydrogen production	https://www.birminghamairport.co.uk/media-information/news/2023/05/birmingham-airport-and-zeroavia-explore-plans-for-renewable-hydrogen-production/
Boeing	27/11/2023	Net Zero Coalition Membership Expands	https://www.governova.com/news/press-releases/net-zero-coalition-expands-membership-to-10-companies-unveils-american-innovation
	20/11/2023	Boeing Joins UAE based research consortium for renewable and advanced aviation fuels	https://www.asdnews.com/news/aviation/2023/11/20/boeing-joins-uae-based-research-consortium-renewable-advanced-aviation-fuels
	16/11/2023	Initiative to advance SAF among APEC Economies	https://boeing.mediaroom.com/2023-11-16-Boeing-and-U-S-Government-Launch-Initiative-to-Advance-Sustainable-Aviation-Fuel-among-APEC-Economies
	14/11/2023	Partnership to advance SAF	https://boeing.mediaroom.com/news-releases-statements?item=131364



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SA Member	Press Release Date	Announcement Summary	Link to press release
SA member announcements			
Boeing	08/11/2023	Boeing joins Aireg initiative for SAF	https://aireg.de/2023/11/08/boeing-joins-aireg-the-german-initiative-for-sustainable-aviation-fuels/
	12/10/2023	Testing SAF benefits with Air-to-Air Flights	https://boeing.mediaroom.com/2023-10-12-Boeing.-NASA,-United-Airlines-To-Test-SAF-Benefits-with-Air-to-Air-Flights
	05/10/2023	Masdar and Boeing join forces to accelerate SAF industry in UAE and globally	https://news.masdar.ae/en/News/2023/10/05/07/46/Accelerating-the-Sustainable-Aviation-Fuel-Industry
Bristol Airport	21/03/2024	Bristol Airport enters milestone solar energy agreement with Luminous Energy	https://www.bristolairport.co.uk/corporate/news-and-media/news-and-media-centre/2024/3/bristol-airport-enters-milestone-solar-energy-agreement-with-luminous-energy/
	14/12/2023	Bristol Airport becomes first UK regional airport to reach 4+ in international carbon accreditation scheme	https://www.bristolairport.co.uk/corporate/news-and-media/news-and-media-centre/2023/12/bristol-airport-becomes-first-uk-regional-airport-to-reach-level-4plus-in-international-carbon-accreditation-scheme/
	12/10/2023	Daimler Buses UK Ltd: Embracing a local approach for future investments - order of all electric transfer buses	https://www.bristolairport.co.uk/corporate/news-and-media/news-and-media-centre/2023/10/daimler-buses-uk-ltd-embracing-a-local-approach-for-future-investments/
	11/10/2023	Yunex Traffic supports Bristol Airport on its road to net zero	https://www.bristolairport.co.uk/corporate/news-and-media/news-and-media-centre/2023/10/yunex-traffic-supports-bristol-airport-on-its-road-to-net-zero/
	10/05/2023	Bristol Airport Commences work on Solar Farm	https://www.bristolairport.co.uk/corporate/news-and-media/news-and-media-centre/2023/5/bristol-airport-commences-work-on-solar-farm/
DHL	19/03/2024	Scaling the use of SAF	https://group.dhl.com/en/media-relations/press-releases/2024/scaling-the-use-of-sustainable-aviation-fuel.html
	14/03/2024	DHL opens operationally carbon neutral facility in Coventry	https://www.dhl.com/gb-en/home/press/press-archive/2024/dhl-opens-operationally-carbon-neutral-facility-in-coventry.html
Edinburgh Airport	19/09/2023	Positive development as electric car chargers installed	https://corporate.edinburghairport.com/positive-development-as-electric-vehicle-chargers-installed



ANNEX

SA Member	Press Release Date	Announcement Summary	Link to press release
SA member announcements			
Farnborough Airport	25/10/2023	Farnborough Airport sells its millionth litre of sustainable aviation fuel	https://www.farnboroughairport.com/news/farnborough-airport-sells-its-millionth-litre-of-sustainable-aviation-fuel
	12/10/2023	Farnborough Airport embarks on one of the largest solar installations in the south east	https://www.farnboroughairport.com/news/farnborough-airport-embarks-on-one-of-the-largest-solar-installations-in-the-south-east
	25/07/2023	Farnborough Airport becomes the UK's first business aviation airport to achieve the highest level of carbon accreditation	https://www.farnboroughairport.com/news/farnborough-airport-becomes-the-uks-first-business-aviation-airport-to-achieve-the-highest-level-of-carbon-accreditation
Firefly	12/04/2024	Firefly announce plans for world-first sewage-to-SAF plant in Harwich	https://flyfirefly.uk/significant-progress-made-towards-commercialisation/
HIAL	13/03/2024	HIAL invests over £9 million in energy efficient runway lighting	https://www.hial.co.uk/news/article/157/hial-invests-over-9-million-in-energy-efficient-runway-lighting
Jet2	16/04/2024	Jet2.com to use SAF at London Stansted Airport	https://www.jet2.com/news/2024/04/Jet2_com_to_use_Sustainable_Aviation_Fuel_at_London_Stansted_Airport
	07/03/2024	SAF use on flights from Bristol Airport in 2024	https://www.jet2.com/news/2024/03/Jet2_com_to_use_Sustainable_Aviation_Fuel_on_flights_from_Bristol_Airport_in_2024
LanzaTech	28/03/2024	SAF Facility permission granted	https://www.britishaviationgroup.co.uk/news/sustainable-aviation-fuel-facility-permission-granted/
	28/11/2023	LanzaTech awarded sustainable markets initiative 2023 Terra Carta Seal	https://lanzatech.com/lanzatech-awarded-sustainable-markets-initiative-2023-terra-carta-seal/
Loganair	01/03/2024	Logainair announces latest round of funding for sustainability projects across the UK	https://www.loganair.co.uk/our-story/latest-news/2024/loganair-announces-latest-round-of-funding-for-sustainability-projects-across-the-uk/
	31/01/2024	Set sights on debuting worlds first operational hydrogen electric by 2027	https://cranfieldaerospace.com/loganair-and-cranfield-aerospace-solutions-set-sights-on-debuting-worlds-first-operational-hydrogen-electric-britten-norman-islander-in-kirkwall-by-2027/
Newcastle Airport	31/01/2024	Newcastle International Airport recognised for reduction in carbon emissions	https://www.newcastleairport.com/news-and-reporting/latest-news/newcastle-international-airport-recognised-for-reduction-in-carbon-emissions/



ANNEX

SA Member	Press Release Date	Announcement Summary	Link to press release
SA member announcements			
RCA	28/02/2024	A leap towards a greener future: RCA's Exeter Airport wins hydrogen challenge	https://www.rca.aero/media/2024/4/12/a-leap-towards-a-greener-future-rcas-exeter-airport-wins-hydrogen-challenge
Velocys	12/02/2024	Growth capital with new chapter as a private SAF technology	https://velocys.com/2024/02/12/velocys-secures-us40mm-of-growth-capital-and-begins-new-chapter-as-a-private-sustainable-aviation-fuel-technology-company/
	23/10/2023	Launch of SAF technology facility	https://velocys.com/2023/10/23/launch-of-52500-sq-ft-state-of-the-art-technology-facility/
	10/05/2023	Altalto Immingham Project Update	https://velocys.com/2023/05/10/altalto-immingham-project-update/
ZeroAvia	01/02/2024	Partnership on Clean On Demand Flight across Europe	https://zeroavia.com/zeroavia-and-flyv-partner-on-clean-on-demand-flight-across-europe/
	24/01/2024	State-of-the-art silicon carbide Aviation Inverter Runs at world-leading performance	https://zeroavia.com/aviation-inverter-performance/
	22/04/2024	Grant awarded for high efficiency liquid hydrogen refuelling trucks in California	https://zeroavia.com/zeroavia-awarded-california-energy-commission-grant-to-develop-high-efficiency-liquid-hydrogen-refueling-trucks/
	16/01/2024	Partnership to explore cryo-compressed hydrogen for airports and aircraft	https://zeroavia.com/zeroavia-and-verne-partner-to-explore-cryo-compressed-hydrogen-for-airports-and-aircraft/
	10/01/2024	Airport Hydrogen supply to support zero emission flights	https://zeroavia.com/zeroavia-and-scottishpower-hydrogen-supply/
	28/11/2023	Engines to power Ecojet	https://zeroavia.com/ecojet/
	16/11/2023	Japan Airlines and ZeroAvia partnership for hydrogen-electric flights in Japan	https://zeroavia.com/japan-airlines/
	19/07/2023	ZeroAvia successfully completes initial Dornier 228 Flight Test Campaign	https://zeroavia.com/complete-flight-test/
Sustainable Aviation	11/03/2024	SA Manifesto Launched	https://www.sustainableaviation.co.uk/news/a-manifesto-for-uk-leadership-in-sustainable-aviation



ANNEX

Net vs. gross emissions data

Gross emission - actual vs. forecast chart

Year	SA Forecast activity growth (no improvement emissions)	SA Forecast gross emissions including fuel efficiency mitigations but excluding SAF or carbon trading scheme mitigations	Actual gross emissions including fuel efficiency mitigations but excluding use of SAF or carbon trading schemes
	CO ₂ (MT)	CO ₂ (MT)	CO ₂ (MT)
2019	37.82	37.82	37.81
2020	14.89	14.43	15.27
2021	13.64	13.08	14.62
2022	32.53	30.12	29.32
2023	36.31	33.18	33.99

NOTES:

Actual gross emissions for 2019 to 2022 are calculated from UK Government published Green house gas emissions

Actual gross emissions for 2023 are calculated from provisional UK Government greenhouse gas emissions

SA forecast gross emissions are from the SA 2023 Net Zero Carbon Road-Map published in April 2023



ANNEX

Gross emissions data

Gross emission - actual vs. forecast chart

UK Aviation	GHG CO ₂ Emissions (UK Domestic and Intl)	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
	Domestic emissions (exclu. airport vehicles)	1.5	1.5	1.5	1.5	1.4	1.4	1.6	1.7	1.8	2.0
	International emissions	15.5	15.2	16.9	18.1	18.9	20.1	21.3	22.6	25.2	27.4
Total	MtCO₂e	17.0	16.8	18.4	19.6	20.3	21.6	22.9	24.3	27.0	29.4
	UK Terminal Pax	102,418,000	95,297,000	105,663,000	111,786,000	121,659,000	128,857,000	135,226,000	145,989,000	158,163,000	167,695,000



ANNEX

Gross emissions data

Gross emission - actual vs. forecast chart (continued)

UK Aviation	GHG CO ₂ Emissions (UK Domestic and Int'l)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
	Domestic emissions (exclu. airport vehicles)	2.1	2.2	2.2	2.3	2.4	2.6	2.5	2.3	2.2	2.0
	International emissions	30.2	29.5	28.9	29.7	32.5	35.1	35.6	35.5	34.7	32.9
Total	MtCO₂e	32.4	31.7	31.2	31.9	34.9	37.7	38.1	37.8	36.9	34.8
	UK Terminal Pax	178,611,000	179,921,000	187,444,000	198,707,000	214,432,000	226,958,000	234,051,000	239,570,000	234,972,000	217,739,000



ANNEX

Gross emissions data

Gross emission - actual vs. forecast chart (continued)

UK Aviation	GHG CO ₂ Emissions (UK Domestic and Intl)	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	Domestic emissions (exclu. airport vehicles)	1.8	1.7	1.6	1.7	1.6	1.6	1.5	1.6	1.5	1.4
	International emissions	31.8	33.3	32.4	32.7	32.9	33.4	33.6	36.2	36.6	36.7
Total	MtCO₂e	33.6	35.0	34.1	34.3	34.5	35.0	35.1	37.8	38.0	38.1
	UK Terminal Pax	210,294,000	218,999,000	220,428,000	228,246,000	238,250,000	251,330,000	268,331,000	284,397,000	292,065,000	296,658,000



ANNEX

Gross emissions data

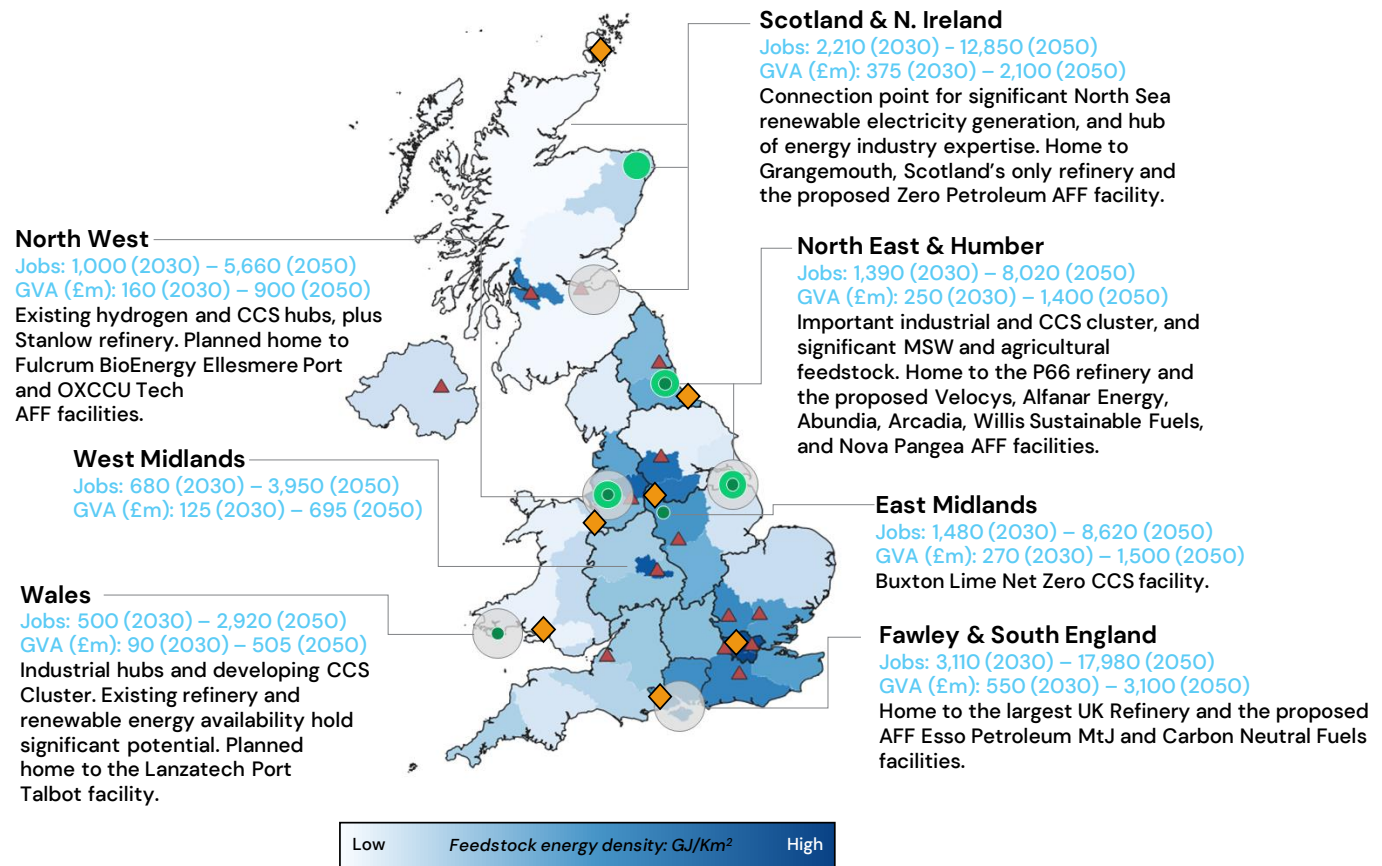
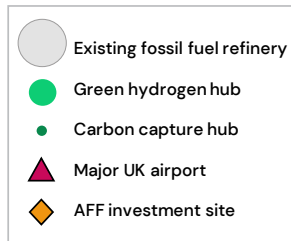
Gross emission - actual vs. forecast chart (continued)

UK Aviation	GHG CO ₂ Emissions (UK Domestic and Intl)	2020 (COVID Pandemic)	2021 (COVID Pandemic)	2022 (COVID Recovery)	2023 (COVID Recovery)	Data Source
	Domestic emissions (exclu. airport vehicles)	0.6	0.7	1.1	1.4	https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-to-2022
	International emissions	14.8	14.0	28.5	32.9	https://www.gov.uk/government/statistics/provisional-uk-greenhouse-gas-emissions-national-statistics-2023
Total	MtCO₂e	15.4	14.7	29.6	34.3	
	UK Terminal Pax	73,674,000	64,257,731	221,652,693	275,681,086	https://www.caa.co.uk/data-and-analysis/uk-aviation-market/airports/uk-airport-data/



ANNEX

UK SAF potential through 2050





ANNEX

Policy Progress Assessment table

SA Road-Map policy recommendation	Progress rating one year on	Progress description	Actions needed
<p>Maximise short-term operational efficiencies by accelerating the UK airspace modernisation programme and completing it by the end of the decade</p>		<p>In the past two years alone, 10 higher level airspace changes have been implemented across the UK, driving carbon savings that exceed 50,000T CO₂ per year – that is equivalent to the annual carbon output of roughly 14,000 family homes. The ‘once in a generation’ redesign of the London, Scottish and Manchester terminal airspace areas continues.</p> <p>Once airspace changes are in place, they often deliver more benefits than are forecast in modelling. Free Route Airspace over Scotland, introduced in 2021, is preforming at twice the estimated carbon saving. While the biggest changes often take the longest to deliver, small changes delivered quickly that tackle busy hotspots in UK airspace are playing a significant role. Eight of these have been implemented since 2021 saving 33,000T of CO₂ annually, incrementally improving efficiency for airlines and advancing our commitment to industry emissions targets.</p> <p>The pace of the modernisation programme is, however, dictated by the need to coordinate proposals for arrival/ departure routes and the network across multiple sponsors, and the requirement for consultation in line with CAA process.</p>	<p>We welcome Government listening to industry concerns over the pace of delivery for airspace modernisation. However, Government must ensure industry can remain in part-control and have input in both the setting up and delivery of the Single Design Entity (SDE). It is critical that any suggestions to governance are not on top of existing processes, adding unnecessary layers of bureaucracy; instead, we propose reform of the current governance system.</p> <p>Speed is critical – Government need to accelerate the timeline for public consultation and speed up the time the SDE will take (current estimations of 24 months are too long) so that airspace modernisation can be delivered within an acceptable timeframe.</p> <p>Integrated planning processes, across all national and devolved administrations needs to be stepped up to keep progress on track, as well as an immediate focus on completing setting up the Single Design Entity as soon as possible as the authority overseeing the whole programme.</p>



ANNEX

Policy Progress Assessment table

SA Road-Map policy recommendation	Progress rating one year on	Progress description	Actions needed
Delivering commercial UK Sustainable Aviation Fuel production at scale this decade by providing a revenue certainty mechanism for SAF to deliver at least five UK SAF plants under construction by 2025		<p>The commitment⁹ to introduce a revenue certainty mechanism to support sustainable aviation fuel (SAF) production in the UK by the end of 2026 was a positive step and recognised the principle behind this key ask in our industry decarbonisation road-map. Once in place, this mechanism will help unlock billions of pounds of private investment in the UK.</p> <p>A consultation on scheme design was launched in April 2024. However, the timeline for implementation is out of step with the timescale for five plants to be under construction by 2025. There are several SAF production projects in development, however none have reached final investment decision whilst awaiting clarity on the revenue certainty mechanism, and mandate.</p>	<p>Currently there is only one SAF production facility in the UK, with Phillips 66 refinery in the Humber the first in the U.K. to produce SAF at scale.</p> <p>Our collective aim must be to ensure UK aviation can access sufficient volumes of SAF at a competitive price to meet mandated volumes, whilst minimising the cost impact on consumers and helping to protect and grow the benefits that aviation and a new SAF industry will bring to the UK.</p> <p>Current timelines will not deliver five plants under construction by 2025. Consequently, critical actions now needed include:</p> <ul style="list-style-type: none"> • Implementing a government-backed revenue support mechanism urgently and in line with timelines for delivery of five plants under construction by 2025 • Prioritising access to UK sustainable feedstocks • Matching EU incentives supporting SAF uptake and production
Legislating for a SAF mandate		<p>In April the government confirmed new targets to ensure 10% of all jet fuel in flights taking off from the UK comes from sustainable sources by 2030 through its Sustainable aviation fuel mandate. Subject to parliamentary approval the mandate will come into effect in January 2025.</p>	<p>Legislation to implement the mandate is still required in 2024.</p> <p>To ensure that the mandate is delivering cost-competitive SAF at the volume required, the Government must keep the policy under review and match the measures seen in the EU and US to drive down the cost of SAF, so that the UK can stay a competitive global aviation leader as we continue to decarbonise.</p>

⁹ <https://www.gov.uk/government/speeches/government-support-for-a-uk-saf-industry#:~:text=The%20scheme%20will%20provide%20an,pathways%20that%20can%20receive%20support>



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Policy Progress Assessment table

SA Road-Map policy recommendation	Progress rating one year on	Progress description	Actions needed
<p>Ensure access to sustainable waste feedstock by recognising the strategic decarbonisation role of SAF in the waste management hierarchy</p>		<p>The Road-Map shows that feedstock availability should not be a limiting factor in SAF deployment in the UK, subject to appropriate policies that ensure aviation has access to feedstocks alongside other parts of the economy, and that feedstocks are prioritised to where they deliver the maximum carbon reduction benefit.</p> <p>However, new analysis by ICF¹⁰ shows that every year, around 8.5m tonnes of household rubbish are burned to make electricity when items cannot be recycled or re-used. The research from ICF reveals that the reduction in carbon emissions from using bin bag waste to make SAF would be at least five times greater than that achieved by incinerating the same waste to generate electricity.</p> <p>SAF made from waste emits 89% less carbon than burning conventional jet fuel. This means that using waste to make SAF results in a much bigger reduction in carbon emissions than incinerating it to make electricity - because nearly 50% of all UK electricity already comes from renewable sources.</p>	<p>The DEFRA waste hierarchy should be amended to prioritise SAF over Energy-from-Waste, reflecting the carbon savings of SAF over EfW. This would help secure non-recyclable municipal solid waste (MSW) as a feedstock for 2G SAF, as waste authorities would follow the hierarchy when disposing of MSW.</p> <p>Defra has given councils the green light to send the waste they collect to make SAF, with many disposal contracts due for renewal in the coming months and years.</p>
<p>Uplift matched funding levels to the ATI programme through to 2031 - to drive efficiency improvements and the development of zero carbon emission technologies</p>		<p>The Government's £4.5bn package of support for manufacturing in the Autumn Statement included a commitment to extend the ATI's funding, with an additional £975 million from 2026 to 2030. Combined with industry co-funding, this will amount to nearly £2 billion of additional investment in sustainable aerospace research and technology.</p> <p>The technologies nurtured by industry and government co-investing through the ATI programme offer immense potential for the UK, both economic and environmental; according to the ATI's latest Annual Review the prize of flight decarbonisation in the UK could increase aerospace's gross value added from £8.4bn (as of 2021) to over £37bn by 2050.</p>	<p>Ultimately, with more investment we could go further, faster.</p> <p>The Government should now commit to uplifted, ten-year long-term R&D support to 2035 through the ATI programme to drive further development of lower noise, ultra-efficient and ZEF technologies.</p> <p>Beyond ATI R&D funding, further steps are also now required to support scale-up and commercialisation of zero emission technologies and the infrastructure needed to support them, over the long-term (see below).</p> <p>The Government should ensure that there is a sufficient domestic supply of liquid hydrogen to support R&D and testing in the UK.</p>

¹⁰ <https://mediacentre.magairports.com/make-saf-not-electricity-from-household-waste-urges-boss-of-uks-largest-airports-group/>



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Policy Progress Assessment table

SA Road-Map policy recommendation	Progress rating one year on	Progress description	Actions needed
Invest in the UK hydrogen supply and airport infrastructure		<p>Currently there are no major projects underway at commercial airports with Government support to target hydrogen production or refuelling infrastructure to support early adoption of hydrogen propulsion systems potentially threatening the Jet Zero Goal of zero-emission flights by 2030.</p> <p>We welcome the work of the Jet Zero Council Zero Emission Flight Delivery Group which since its establishment has been active in addressing these challenges of developing and commercialising zero carbon emission technologies, including through detailed action plans.</p>	<p>Support is now required for commercialisation of new technologies in the UK. This includes ensuring the investment and regulatory environments secure the UK’s leading position on sustainable aviation power propulsion, to support scale-up, industrialisation and delivery of required infrastructure.</p> <p>Is also means ensuring the CAA is effectively resourced to lead on the development of the required standards, procedures and regulations of hydrogen-powered aircraft, and certification of novel low and ZEF technologies including hydrogen to enable safe and timely entry-into-service, with a clear remit and direction from Government to support the sector deliver net-zero. The CAA should take on a critical role, together with EASA and the FAA, in driving regulatory alignment on certification, the operation of hydrogen-powered aircraft, and related infrastructure.</p> <p>The Government should establish a National Hydrogen Academy to be operational by 2025, with hydrogen handling skills and training programmes for airport ground operations.</p> <p>The Government should also update its guidance on the development of airport masterplans so that it includes a requirement to consider future hydrogen infrastructure needs, and recommend that every airport should have a broader “hydrogen-ready” plan.</p> <p>There is a need for a network of hydrogen pioneer airports to serve as a testing ground for accelerating hydrogen-powered aviation – the location, funding, and governance of this programme should be finalised within the next 18 months.</p>



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<p>Integrate low carbon strategies to accelerate progress to net zero by aligning all of Government to ensure sufficient electrical and hydrogen generation is in place</p>		<p>A lack of dedicated renewable power/ hydrogen production capability will impact decarbonisation via both hydrogen direct and synthetic aviation fuel.</p>	<p>This is assessed as being nearly red - The government needs to develop a strategic plan to align on a strategic plan to ensure the UK can generate the 150 - 200 extra TWh in renewable energy UK aviation will require to transition to net zero, including to produce electricity for sustainable fuel production such as producing hydrogen as both a feedstock for Power to Liquid SAF and a direct fuel. This includes ensuring a modernised UK electricity grid can deliver capacity and that Ofgem can approve National Grid to act proactively, rather than reactively, to deliver UK aviation's energy transition.</p>
<p>UK ETS should incorporate GGRs credits to help establish initial investor confidence and consider the introduction of a mechanism to close the gap between ETS prices and the cost of supplying GGRs</p>		<p>Our Road-Map forecasts the need for around 9 million tonnes of carbon removal for UK aviation by 2050.</p> <p>The existing UK energy strategy and carbon capture and storage ambitions, set out in the UK Clean Growth Strategy need to be better integrated into the Jet Zero Strategy.</p> <p>The UK Government response to the Engineered Greenhouse Gas Removals business model consultation noted it would be 'working with the ETS authority to consider options for integrating GGRs into the UK ETS' and would be consulting in 2023. In Dec 2023 a policy paper reiterated this commitment to consult, but timelines appear to be slipping.</p>	<p>We need to accelerate the rollout of carbon removal and carbon capture and storage technology to mitigate residual aviation carbon emissions, by including carbon removals the UK ETS scheme and ensuring aviation's fair share. The Government should also develop proposals on how to treat hydrogen fuel the same way in the UK ETS as SAFs meaning that for any volume of hydrogen fuel used, airlines should receive the equivalent of ETS allowances or a zero-emission rate as deemed appropriate.</p> <p>There is an urgent need to ensure that engineered carbon removals are integrated into the UK Emissions Trading Scheme, alongside ensuring aviation's fair share of carbon removal is built into the UK Clean Growth Strategy and associated funding support.</p> <p>The government should clarify the role for engineered greenhouse gas removals (GGR) business models, including timings and eligibility. This would help to accelerate carbon removals technologies that are an important part of the industry's plan to achieve net zero aviation by 2050.</p>



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<p>Government and industry should capitalise on this to influence CORSIA, working with ICAO to provide incentives to expand the volume of removals in CORSIA pre-2035 and for a new mechanism driving the transition to durable GGRs post-2035</p>			
<p>Continued focus on high integrity carbon credits in the voluntary carbon market, including efforts to support UK nature-based and engineered carbon removal projects to scale, contributing to a stable emerging market in net zero aligned offsets</p>		<p>Sustainable Aviation has established a cross-industry working group to explore the potential for an advanced market signal that will help the carbon removal industry scale up. This aims to build on existing airline specific commitments for carbon removals. The approach requires further work and alignment with Government policy to ensure it delivers the best potential for the UK.</p>	<p>Sustainable Aviation will complete our proposal for an advanced market signal by Summer 2024.</p> <p>UK Government must develop a clear carbon removal policy for aviation that secures access to our fair share of the UK CCUS planned capacity.</p> <p>In partnership, industry and Government must continue to evolve proposals to scale CCUS in the UK and ensure this effort is bankable through the UK ETS and other carbon trading schemes.</p>

