Greenwashing *the* Skies

How the Private Jet Lobby Uses
"Sustainable Aviation Fuels"
as a Marketing Ploy

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Introduction

The U.S. Congress is positioned in the coming weeks to pass an FAA Reauthorization bill that includes growing investment in "sustainable aviation fuels." And the U.S. Treasury department has just issued new guidelines for the Sustainable Aviation Fuel (SAF) Credit, a provision of the 2022 Inflation Reduction Act. It is time for the wider public and policy makers to take a closer look at these multi-billion-dollar investments.

When we encounter "sustainable aviation fuels" (SAFs), we should consider them like products with ambiguous "all natural" labels — we need to take a closer look at the ingredients. While there are kernels of possibility surrounding the development of sustainable aviation fuels, claims that alternative fuels will be a timely substitute for kerosene-based jet fuels require a healthy dose of skepticism.

Currently, "sustainable aviation fuel" is largely a marketing term promoted by the aviation industry to deflect concerns about the sector's vast greenhouse gas emissions. This is not to dismiss that there are real possibilities for aviation decarbonization. We know, for example, that electrification of small short-range aircraft is a real option that can be scaled up in the coming decade. And there may be real possibilities with green hydrogen, synthetic fuels, and other innovations. However, some alternative fuels may have potential while others may contribute to greater ecological and social harms. We should be wary that industry claims about alternative fuels are exaggerated and that instead these fuels may have major ecological downsides.

This paper is written for nonscientific readers to sort through the industry's hype and its substantial communications capacity. It engages with the possibility and reality of alternative aviation fuels, which we will refer to as sustainable aviation fuel or SAF to match the language of stakeholders, including the aviation sector and government actors.

Key Findings

There is currently no realistic or scalable alternative to kerosene-based fuels that would meet current aviation needs, let alone projections of future growth. And at present, SAF technologies are not moving at the speed of climate change and would fail to meet U.S. climate goals by the target year of 2050.

Though it may be technologically possible to eventually create alternate fuels for private jets, policymakers should consider the tradeoffs in terms of government subsidies, land use changes, and competing decarbonization needs in other sectors. Private jet expansion, even with alternative fuels, is the least defensible use of societal resources on a warming planet.

Sustainable aviation fuels are critical to the aviation sector's vision for growth. The private and commercial aviation sectors are planning on major growth in the aviation industry, and they recognize that massive emissions — and the concomitant negative publicity — is a barrier to expansion. The industry's primary solution is "sustainable aviation fuels" or SAFs, an umbrella term for a wide variety of alternative fuel sources, some of which are promising while others are highly speculative.

The private jet aviation market remains resilient. Private aviation enjoyed a strong 2023. Even though private jet operations and transaction dollar volume were down compared to 2022, both were still above pre-pandemic levels. There were close to 5.1 million private jet flights taken in 2023 with a transaction dollar volume of $32.2 billion.

Scaling up SAF production may thwart emissions reduction goals. Currently, in order to rapidly expand the production of sustainable aviation fuels, producers must use biogenic feedstocks. However, accompanying agricultural land use changes could threaten global food security as well as nature-based carbon sequestration solutions such as the preservation of forests and wetlands. Plus, burning SAFs still emits CO_2 — sometimes more than that of kerosene-based jet fuel. As such, SAF production may actively undermine Paris Agreement emissions reduction targets. Examples of land use trade-offs include:

- According to the World Resources Institute, the production of 35 billion gallons of SAF, as is the Biden administration's current goal, would require 114 million acres of corn — 20 percent more than the current, total land area of corn crops in the U.S.

- According to a 2023 report by the UK Royal Society, replacing jet fuel with biomass would require the UK to give up 50 percent of its agricultural land to sustain current flight passenger levels.

Realistic increases in SAF production are decades off. In 2022, the U.S. produced just 15.8 million gallons of SAF. Meeting the Biden administration's 2030 SAF production target of 3

billion gallons per year would require an 18,887 percent production increase over the next six years. To meet the 2050 target of 35 billion gallons, production would have to increase a whopping 227,400 percent over 2022 production levels.

The aviation industry has a twenty-year history of missing its SAF production benchmarks. The International Air Transport Association (IATA) announced an aggressive climate goal in 2007, asserting that SAFs would account for 10 percent of all jet fuel consumed by the aviation sector within a decade. The target was never met. IATA proceeded for the next ten years to make their goals less ambitious while still failing to meet them. It predicted SAFs would hold a 3 percent market share by 2020, but SAFs currently account for just 0.2 percent of the total jet fuel supply.

The cost of SAF infrastructure and production will require massive subsidies. The aviation industry is asking for substantial governmental subsidies in order to increase the scale of SAF production. The Biden administration has estimated that the infrastructure necessary to meet the annual production goal of 3 billion gallons by 2030 could cost roughly $30 billion in capital expenditures. The U.S. government would likely need to pour tens of billions of dollars into additional SAF subsidies to incentivize corporations to build relevant infrastructure and mandate the use of SAFs, thus further subsidizing the aviation industry and, specifically for our purposes, private jet travel.

The aviation industry is already lobbying to weaken standards and sustainability definitions. Even while touting its commitment to sustainability, the U.S. aviation industry is aggressively lobbying to water down SAF definitions, which would shift climate goalposts. The aviation industry has teamed up lobbyists for Big Corn to press for corn-based ethanol expansion which has dubious benefits in reducing life cycle emissions, especially when factoring in land use changes.

A key question remains: Are SAFs a serious alternative solution or a PR strategy? The aviation industry is failing to meet climate benchmarks while it promotes aggressive communications and advertising campaigns meant to demonstrate its commitment to environmentalism. The flurry of publicity around Virgin Atlantic's so-called “100 percent SAF flight” reveals the industry’s real intentions: greenwashing (see box on p. 9).

The best way to be green is to stay grounded. We know that reducing carbon and other greenhouse gas emissions is the most effective and most direct strategy against climate change. Regarding aviation, especially private aviation, this can simply mean flying less and curtailing the demand for air travel.

More independent research into SAF is necessary. In order to determine the effectiveness of SAFs and the best way to produce them, more research is needed from independent research bodies

that are not funded or influenced by the fossil fuel or aviation industries. We must learn more about SAF fuel sources, estimated timetables, and costs — including opportunity costs like competing decarbonization needs.

Clearing the Emissions Smoke: Asking the Right Questions

The key questions we should be asking about SAFs include:

Fuel Source? What is the source of the fuel? Is it a biofuel? From what source of biomass? Is it a synthetic fuel? If so, what is the source of energy for its creation? What is the life cycle emissions impact?

Scale/Timetable for Deployment? What is the scale and timetable for bringing this fuel source to widespread use? By what year might it achieve reductions? Is this realistic, given the aviation sector's inability to meet its own climate benchmarks?

Cost to Consumers and Taxpayers? What are the costs, including the real government subsidies, that will be required to scale this fuel source? Are more efficient allocations of resources available?

Competing Decarbonization Needs? What are the competing needs for this fuel source? For example, will the fuel source compete with other sectors in decarbonization such as ground transportation, agriculture, heating, and power generation? Can we justify putting decarbonization of optional and luxury private jet travel ahead of wider societal needs?

Greenwashing the Skies: *How the Private Jet Lobby Uses "Sustainable Aviation Fuels" as a Marketing Ploy*

How SAF Became Aviation's Answer to Climate Change

The fight to curb the use of fossil fuels has attracted the concern of private aviation companies — or at least the concern of their pocketbooks. As the climate crisis intensifies and the private jet industry faces a possible reckoning over the emissions it produces, companies and lobbyists are touting new commitments to sustainability and emissions reductions.

Worldwide, the aviation sector is responsible for approximately 4 percent of human-induced climate change. Though other sectors, such as trucking and shipping, currently contribute more to climate change, aviation industry emissions have grown much more rapidly than emissions from these other sectors.[1] And growth is estimated to continue. If aviation demand continues to grow as projected, aviation emissions could triple by the year 2050.[2]

The problem is exacerbated by private jets. Although they were responsible for just 4 percent of aviation's total pre-pandemic emissions, private jets emit a highly disproportionate 10 to 20 times more pollutants per passenger than commercial planes.[3] Private jet use substantially increased during the pandemic, and demand is still higher than pre-pandemic levels. According to aviation data company WingX, global private jet activity in January 2024 was up 18.2 percent compared to the same month in 2020. These demand trends continue to hold when focused solely on the North American market.[4]

The United States is home to an estimated 14,870 private jets, more than 63 percent of the total global fleet.[5] According to data from the Federal Aviation Administration, general aviation private jets in the U.S. consumed approximately 1.7 billion gallons of jet fuel in 2022.[6] Based on this consumption estimate, U.S. private jets emitted more than 16 million metric tons of carbon in 2022.[7]

Many in the private jet industry aim to primarily reduce their emissions by using less-polluting alternatives to fossil jet fuel, commonly referred to as "sustainable aviation fuel" or SAF. According to the International Civil Aviation Organization (ICAO), the United Nations agency tasked with overseeing international aviation guidelines, SAFs are "renewable or waste-derived aviation fuels that [meet] sustainability criteria."[8] This fuel is typically made from crops or waste and can be substituted for current forms of jet fuel, or more likely mixed with it, ostensibly reducing the carbon life-cycle emissions of aviation fuel.

Though alternative aviation fuels have been presented as the solution to decarbonizing the aviation industry, we find that they are largely, so far, a false solution.

Because of aviation's severe, negative impact on the environment and its contributions to climate change, it is clear that urgent change is necessary. Outside of planes simply flying less, aviation emissions could be mitigated with a handful of technological advancements, the majority of which have not yet been developed to scale, such as hydrogen-powered aircraft, electric-powered aircraft, and SAF replacing jet fuel.

SAFs require the least amount of capital-intensive change (compared to retrofitting current aircraft or inventing new aircraft), thus they are the most attractive solution for the industry. The Business Aviation Coalition for Sustainable Aviation Fuel, a coalition of private aviation trade groups, described SAF in a 2020 report as "the single-largest potential reduction in aviation's [greenhouse gas] emissions — and the key to reaching goals for reducing them."[9] The Biden administration too has referred to SAF as "a key aviation climate priority."[10]

But SAFs are not a panacea for the aviation sector. These fuels are a dubious solution to the critical problem of aviation's culpability in the climate crisis—in part because there is no clear, undisputed definition of what constitutes a "sustainable aviation fuel."

"Not all alternative fuels are equal; some can make environmental problems worse," director of sustainable international transport and lead senior economist for the Environmental Defense Fund, Pedro Piris-Cabezas, wrote in 2022.[11] Indeed, while SAFs could play a role in aviation's road to net zero carbon emissions, additional change will be needed to fully mitigate aviation's contribution to the climate crisis.

"Net Zero" is a Controversial Term

The term "net zero" is standard in mainstream climate discourse and is particularly central to the aviation industry's climate plans. Indeed, airlines as part of the International Air Transport Association passed a resolution in 2021 committing to reach net zero emissions by 2050.[12] But such a commitment does not necessarily mean that airlines will reduce their emissions, but merely that they will offset or compensate for them, possibly by removing carbon from the atmosphere. While carbon removal can occur naturally by restoring and protecting forests that can store carbon, complex—and controversial—carbon removal technologies are still in their infancy. Clearly, emissions reductions are vital to limit the scale of the climate crisis, and the aviation industry cannot be overly dependent on carbon removal to reach its climate goals. We use the term "net zero" because corporate and governmental actors describe their plans in this way, but we also recognize the possible limitations of a net zero approach.

Virgin Atlantic Flight 100: A Path to Green Aviation or Expensive Stunt?

On November 28, 2023, Virgin Atlantic flight VS100, using 100 percent sustainable aviation fuels, flew from London's Heathrow Airport to New York's John F. Kennedy International Airport. The fuel on the Boeing 787 aircraft was made from a combination of waste fat products and plant sugars. Previous flights have used blends of as much as 50 percent alternative fuels blended with kerosene-based jet fuel. This was the first flight using 100 percent SAFs.

The much-touted trans-Atlantic flight included celebrity passengers such as Virgin founder and billionaire Sir Richard Branson who put on display his techno-optimism, stating "The world will always assume something can't be done, until you do it."

Another passenger, UK transport Minister Mark Harper, hailed the flight as demonstrating "how we can decarbonize transport both now and in the future, cutting lifecycle emissions by 70 percent and inspiring the next generation of solutions." The UK government chipped in $1.25 million USD to the project and is initially investing $67 million USD to fund five SAF development projects in the UK.[13]

Virgin Atlantic confirmed that the CO2 emissions from flight VS100 were identical to a flight using fossil fuels. The emissions reduction, claimed to be 70 percent less for the flight, came from reduced carbon deployed in the production process of recycling oils. The fuel that powered the Virgin Atlantic flight was a mix of fat-based biofuel and plant-based "synthetic aromatic kerosene" made from plant sugars with aromatic compounds required to keep the jet engine humming smoothly (and possibly smelling nice too?).

Advocates are excited that these SAF fuels can be "drop-in" substitutes for kerosene-based fuels, unlike innovations with electrical and hydrogen technologies that require reengineering of aircraft. Still, aircraft using 100 percent SAFs will require some reengineering. Flight VS100 was made possible by a retrofitted engine created by Rolls-Royce.

Many of the aviation industry passengers spoke about the need for more subsidies for sustainable aviation fuel production. SAFs only represent 0.2 percent of US airlines current fuel consumption. Shai Weiss, the CEO of Virgin Atlantic, signaled the need for greater private and government investment in SAFs, saying at the time of the flight, "There's simply not enough SAF and it's clear that in order to reach production at scale, we need to see significantly more investment." He went on to add, "This will only happen when regulatory certainty and price support mechanisms, backed by [the] government, are in place."[14] (Continued on next page)

Creating a new generation of aviation fuels using renewable energy sources is scientifically possible. But there are questions about the subsidy cost and trade-offs with competing decarbonization goals (like reforestation) and human needs (like growing food). The policy question is whether private jet expansion is the best use of such renewable energy resources including the productive land and taxpayer subsidies.

Flight VS100 was a high visibility and one-off stunt that will be impossible to reproduce at scale with growing demand of aviation and the speed of climate change. Lost in the smokescreen is also the harm of convincing the public they can fly without environmental damage.

Sustainable aviation fuel is not necessarily sustainable

The term "sustainable aviation fuel" can be misleading because there is no universal definition of "sustainable," at least not one that all government aviation bodies have recognized with regard to alternative aviation fuels. As a result, there is a wide variety of alternative aviation fuels that could potentially fall under the SAF umbrella. While the aviation industry touts that SAFs can decrease emissions by 80 percent as compared to traditional jet fuel, the true impact on emissions varies by feedstock used to produce the alternative fuel.[15]

Broadly speaking, SAFs are fuels made from biogenic sources (e.g., crops and agricultural waste) or synthetic sources (e.g., e-kerosene, produced using renewable electricity). The vast majority of SAFs currently available in the U.S. market are produced from biogenic sources, as technology for synthetic SAF production is still in the early stages of development. In addition, these biofuels must be combined with traditional jet fuel derived from fossil fuels.

The International Civil Aviation Organization (ICAO), the aviation agency of the United Nations, has adopted stringent standards outlining the sustainability of SAFs. The extensive criteria ensure that eligible fuels reduce carbon emissions over their life cycles as compared to traditional fossil fuels and that SAF should not be sourced from land with high concentrations of carbon.[16]

However, at the national, state, and local levels, these standards can vary. In the U.S., the SAF determination for alternative fuels is less rigorous than the ICAO's SAF definition, allowing for the potential of wide-scale deployment of sustainable aviation fuels to undermine its own stated goals.

The 2022 Inflation Reduction Act (IRA) included a sustainable aviation fuel tax credit meant to incentivize SAF use over traditional jet fuel. The credit requires that fuels achieve a 50 percent reduction in emissions as compared to traditional jet fuel.[17] However, the eligibility of fuel sources

and allowable emissions reduction measurements may allow fuel producers to obtain tax credits for "SAF" that is no better or even worse than kerosene fuel.

While the IRA pointed to the ICAO criteria (or other criteria acceptable under the Clean Air Act) to determine the eligibility of fuel for the tax credit, the Biden administration released guidance in December 2023 that clarified fuel eligibility and may allow the use of additional albeit less rigorous eligibility criteria.[18] Ethanol producers lobbied for the government to allow a specific emissions model, the Greenhouse gases, Regulated Emissions, and Energy use in Technologies (GREET) model. Scientists and environmental advocates charge that GREET would not fully recognize life cycle emissions, due to inadequate consideration of land use changes.[19] The Biden administration confirmed in policy guidance that it would update the GREET model.[20] Indeed, Reuters reported in September 2023 that the administration would spend as much as $400,000 to adjust the GREET model to ensure SAF made from ethanol is eligible for the tax credit.[21]

On April 30, 2024, the U.S. Treasury department released guidelines for new Sustainable Aviation (SAF) Credit, created by the Inflation Reduction Act (IRA), which provides a pathway for corn-based ethanol producers to qualify for the SAF Credit.[22] Using corn-based ethanol for jet fuel rather than food leads to additional land-clearing for farming, a process that may release additional carbon dioxide emissions from tree-cutting, plant and soil. The life cycle of ethanol production may add to climate pollution through planting, fertilizing and harvesting corn as well as refining, distributing and burning ethanol.

The MIT *Technology Review* journal observed, "Ethanol makers who use sustainably produced corn can now qualify for big federal tax credits, but critics are skeptical of the carbon benefits." *Technology Review* quotes Nikita Pavlenko, who leads the fuels team at the International Council on Clean Transportation, that the climate-smart agricultural provisions are "extremely sloppy" and "are not substantiated."[23]

> He said the Department of Energy and Department of Agriculture especially "put their thumbs on the scale" on the question of land-use changes, using estimates of soy and corn emissions that were 33% to 55% lower than those produced for a program associated with the UN's International Civil Aviation Organization.

The lobbyists for the "Big Corn" ethanol industry were no doubt active in establishing these provisions. CarbonPlan's Freya Chey told *Technology Review* that, "US policy has a long history of asking how to continue justifying investment in ethanol rather than taking a clear-eyed approach to evaluating whether or not ethanol helps us reach our climate goals. In this case, I think scrutiny is warranted around the choice to lean on agricultural practices with uncertain and variable benefits in a way that could unlock the next tranche of public funding for corn ethanol."

As a result, the tax credit will be available for fuel made from vegetable oils or corn ethanol.[24] These SAF pathways may actually produce *more* emissions than petroleum jet fuel, and the use of these resources may also introduce competition with food crops for land. According to the World Resources Institute, the production of 35 billion gallons of SAF, as is the Biden administration's current goal, would require 114 million acres of corn — 20 percent more than the current, total land area of corn crops in the U.S.[25] As such, SAF created from corn would not reduce emissions as compared to kerosene jet fuel.[26] Lost food production would lead to the conversion of forests and other land to cropland, a process that both releases stored carbon and limits future carbon sequestration.

Many carbon emission reduction scenarios fail to include the full lifecycle impact of new practices, especially land use changes that may eliminate forests that serve as carbon sinks. And the trade-offs have obvious harms. According to a 2023 report by the UK Royal Society, replacing jet fuel with biomass would require the UK to give up 50 percent of its agricultural land to sustain current flight passenger levels.[27]

While some SAF feedstocks spark land use concerns, SAF created from "waste" may also not be all that sustainable. The most common source for SAF made from waste is not municipal household trash, but animal fat. The use of these feedstocks — byproducts of industrial agriculture — has serious implications for the climate crisis. Besides the fact that incentivizing industrial agriculture encourages the expansion of an industry responsible for 10 percent of emissions, supply of animal fat is not renewable.[28] Animal fat waste is used in other products such as pet food and soap; indeed, the most likely substitute for animal fats in such industries is palm oil. The deforestation that accompanies palm oil production means that the use of animal fat waste in SAF could result in greater, indirect carbon emissions.[29]

SAFs made from green hydrogen or synthetic sources such as e-kerosene are responsible for much fewer emissions than SAFs made from biogenic sources. However, these fuels still take energy to produce, albeit non-fossil fuel energy. There is, however, an opportunity cost in devoting clean energy resources to decarbonizing aviation when these limited resources could be deployed to decarbonize other, more essential sectors through less energy-intensive means, such as the preservation and restoration of forests, grasslands, and wetlands that absorb and store carbon dioxide.[30]

In addition, burning any fuel—whether fossil, biogenic, or synthetic—emits air pollutants in addition to greenhouse gases. Such pollutants as nitrogen oxides, sulfur dioxide, and particulate matter can have serious effects on human health. Historical and current examples suggest that these emissions would disproportionately impact the health of marginalized communities. This may also be the case during the production of alternative jet fuels. For instance, in 2023, *ProPublica* reported that the Environmental Protection Agency (EPA) approved a Chevron plan to produce jet fuel

made from plastic waste, though the EPA determined an associated pollutant is so toxic it could lead to cancer in one in four people exposed to it. The Chevron refinery in question is located in Pascagoula, Mississippi, and is located in an area with large communities of Black and low-income people.[31]

SAF policies diluted by industry

Just as ethanol producers have engaged in lobbying campaigns to benefit from SAF incentivization programs, so too has the aviation industry. This is why we question whether SAFs are realistic or whether they are being used as a marketing ploy by profit-seeking corporations in the aviation industry.

The aviation industry at large — including major private aviation lobbying groups — seems to support SAF tax credits while advocating for weakened SAF standards. InfluenceMap, which researches corporate lobbying, published a July 2023 report on efforts by the ethanol lobby and major U.S. airlines to dilute SAF standards in federal policy.[32] InfluenceMap researchers concluded that these efforts could lead to more production of SAFs derived from corn crops and higher emissions than SAF derived from other pathways.

U.S. airlines are not alone in this lobbying endeavor — major lobbying organizations within private aviation have also been involved as part of the "SAF BTC Coalition." The more than 50 members of the coalition lobbied for the SAF tax credits passed as part of the Inflation Reduction Act of 2022, but have continued to push for lowered standards. "The updated GREET model provides a robust methodology for SAF producers to determine the lifecycle GHG emissions of their products to qualify for the SAF credit," read a National Business Aviation Association (NBAA) press release on the Biden administration's December SAF tax credit guidance. "We are eager for the release of an updated GREET model in the spring," NBAA president and CEO Ed Bolen said in the statement.[33]

In addition, a network of private aviation groups — roughly half of which are also part of the SAF BTC Coalition — have started a campaign to emphasize the industry's commitment to sustainability. The "Climbing. Fast." campaign aims to influence policymakers and the media about how private aviation is "an essential American industry" with a "commitment to a net-zero carbon future [that] is unmatched," as the campaign website reads.[34]

SAF supply is limited and prices are high

The road to aviation emission reductions is complicated by long-haul flights, for which electric planes are infeasible. Though battery-powered airplanes are a promising development, flights are limited to short distances by the heavy weight of batteries.[35] Hydrogen-powered planes, too, can only complete short-haul flights.[36] SAF, on the other hand, is a "drop-in fuel"; it does not require

aircraft to be redesigned and can support long-haul flights. As such, the aviation industry is determined to rely on SAF to decarbonize.

Yet if SAF is to truly be a solution to decarbonize aviation, its production would need to rapidly accelerate. The Biden administration has set an ambitious annual U.S. production target of 3 billion gallons of SAF by 2030 and 35 billion gallons by 2050 (when the aviation industry aims to hit net zero emissions).[37] Yet SAF production is currently limited, as is its use by commercial airliners and private jets. In 2022, the U.S. produced just 15.8 million gallons of SAF. Production would need to increase by 18,887 percent over the next six years just to meet the U.S.'s 2030 goal. To meet the 2050 target of 35 billion gallons, production would have to increase a whopping 227,400 percent over 2022 production levels.

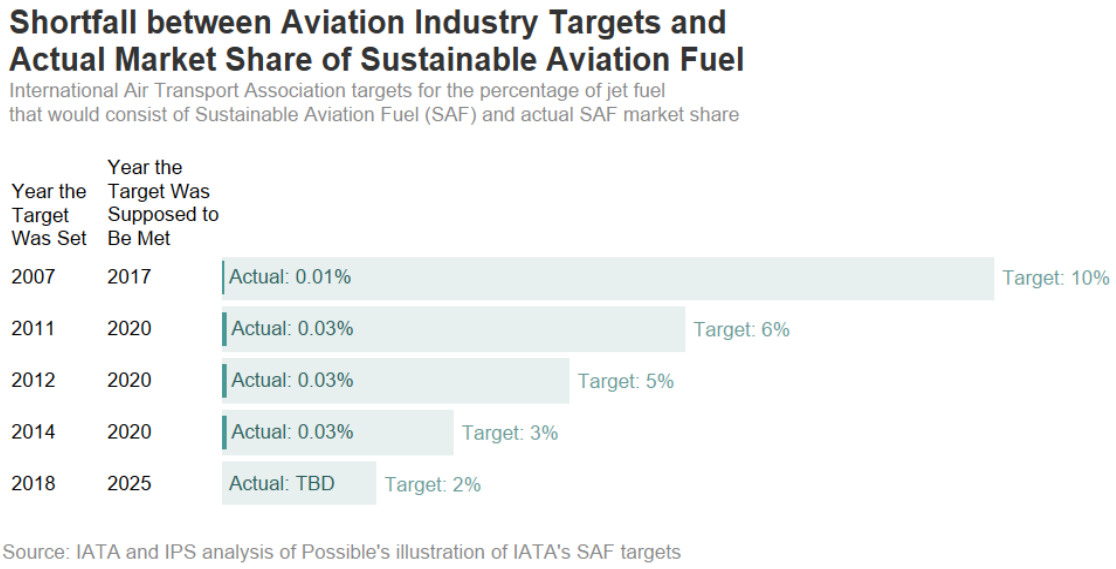
Currently, major airlines can only access SAF at airports in California — Los Angeles International Airport and San Francisco International Airport. Private jets can access SAF at approximately 30 airports. These are mainly concentrated in California, with some additional locations in Washington State, Michigan, Texas, Colorado, and Oregon. Note that there are thousands of U.S. general aviation airports used by private jets nationwide.[38]

As might be expected given limited supply, SAF is currently extremely expensive, a major deterrent to its use.[39] Widespread adoption would require economic incentives for the aviation industry, i.e., heavy subsidies from the government. Besides the high price of the fuel itself, the industry must invest in building efficient SAF supply chains. In the words of the Biden administration, this will look like "an extremely complicated system of systems, including feedstock production, collection, and distribution to SAF production facilities; conversion of feedstock to fuel; and transport, storage, and delivery of the finished fuel to the infrastructure required to fuel aircraft." The administration has estimated that the "extremely complicated system of systems" necessary to meet the annual production goal of 3 billion gallons by 2030 could cost roughly $30 billion in capital expenditures.[40] Because of this hefty price tag, the U.S. would likely need to offer tens of billions of dollars in SAF subsidies to corporations in order to incentivize investments in alternative fuel, thus further subsidizing the aviation industry and, specifically for our purposes, private jet travel.

SAF as a distraction

While the aviation industry's plans to reach net zero by 2050 are laudable, its poor record in achieving previous, self-imposed climate goals invites skepticism. For example, the International Air Transport Association (IATA) announced in 2007 that, within the following decade, SAFs would account for 10 percent of all jet fuel used by the aviation sector. But ten years later, in 2017, SAF production represented a negligible 0.01 percent of all jet fuel consumed by major U.S. airlines.[41] IATA unsurprisingly made its subsequent goals less ambitious, but it continued to miss

its climate targets. In 2011, IATA aimed for a SAF fuel market share of 6 percent by 2020, but the industry group was again forced to move the goalpost. In 2014, IATA aimed for just a 3 percent SAF fuel market share by 2020, but this too was too ambitious.[42] While SAF production tripled from 5.1 million gallons to 15.8 million gallons between 2021 and 2022, SAFs still account for just 0.2 percent of the total jet fuel supply.[43]



The limited SAF supply is alarming for three reasons. The first is that the private aviation sector is experiencing sustained growth compared to pre-pandemic operations. Both 2021 and 2022 were record-setting years for the industry, so a slight sector decline was anticipated for 2023. This occurred as expected: global private jet operations fell 4.7 percent in 2023. But transaction dollar volume in 2023 was more than $32 billion and almost equivalent to the total value realized in 2021, which was itself an extraordinary year for the private jet industry. Furthermore, private jet operations and dollar volume were both 13.7 percent higher in 2023 than in 2019. So, even though the market slowed compared to 2022, it is expected to remain strong and above pre-pandemic levels.[44] Yet the enduring demand for private aviation by the ultra-wealthy undermines our efforts to lower emissions and meet the temperature goals set by the Paris Agreement.

Secondly, companies can reap enormous profits by misleading consumers who believe they are flying green on certain airlines and who are not aware of the limited supply and use of SAFs. A most glaring case of greenwashing in the United Kingdom in 2023 led to a government ban of deceptive advertisements by Air France, Etihad Airways, and Lufthansa. For example, Lufthansa claimed that commercial passengers would be flying more sustainably if they booked their travel with the German airline. However, the British Advertising Standards Authority determined that Lufthansa's marketing was misleading and couldn't be backed up by the company's actions.[45]

The aviation industry can exploit the language of climate justice and "sustainability" to make money, yet companies are often reluctant to invest their own fortunes to develop new and innovative green technologies — suggesting that it is not truly serious about its climate commitments. Instead, the aviation industry is lobbying for massive governmental subsidies.

Finally, it is clear that the industry is depending on SAFs to do the heavy lifting to achieve net zero by 2050 — without disrupting demand. According to IATA's assessment, SAFs will be responsible for roughly two thirds of the reduction in carbon emissions by 2050.[46] If this is to occur, tens of billions of gallons of sustainable aviation fuel will need to be produced over the next 26 years, a herculean task considering the little supply currently in the market, the prohibitive cost of manufacturing alternative fuel, and the growing demand for aviation (both commercial and private). Such challenges have fostered skepticism in more than half of airline executives, who doubt whether the aviation industry will meet its 2050 net-zero target.[47]

As discussed earlier, state intervention via public investment and generous tax incentives would be necessary to create an environment where private companies can bring about economies of scale — without risking their own capital. As such, if an alternative fuel company succeeds in turning a profit, it cannot exploit the tax code or take advantage of other legal mechanisms to avoid paying its fair share of taxes. A quintessential example of this is Apple. The multinational tech company set up a subsidiary in Nevada to duck the taxes it owed to the state of California, even though all of the technology contained in a smartphone was initially developed and funded by the U.S. government.[48] No corporation should be allowed to evade its tax obligations, especially those that are recipients of lavish government subsidies.

Indeed, the scaling up of SAF production may undermine climate goals since the land needed for biomass production may destroy natural climate solutions, such as reforestation efforts.[49] Because a miniscule supply of SAF is currently available in the jet fuel market, its rapid expansion will come from biogenic feedstocks; the production of biofuel is currently more technologically advanced than synthetic fuel. As a result, energy intensive SAF production will emit carbon dioxide through the burning of plant material while carbon removal from future plant growth will either lag or fail to be sufficiently offset.[50]

Though SAFs will undoubtedly play some role in aviation decarbonization, the sector — like all sectors — will still require transformative systems change. The aviation industry must take land use change, and the availability of land, into account when publishing its roadmaps to net zero emissions. It is likely that there is no way forward that does not include lowering flight demand, especially private luxury jets. For the private aviation sector, this means that the jet-owning oligarchy and the multi-millionaires who charter private flights on-demand or through their Jet Card memberships will have to fly less.

The promotion of SAFs as an alternative fuel by the aviation industry and other stakeholders distract us from achieving the goal of reducing air travel demand and diverts our attention away on how large scale SAF production may actually contribute to ecological collapse rather than prevent it.

Conclusion

The aviation industry does deserve some credit: it recognizes the importance of reducing greenhouse gas emissions and is investing in the production of alternative fuels to decarbonize the sector. Unfortunately, sustainable aviation fuels currently represent a blip in the overall jet fuel market and the industry is notorious for missing their sustainable development targets. But that has not stopped some companies from launching advertising campaigns that mislead their consumers about how green they are. There is a straightforward reason why Lufthansa, Etihad, and Air France deceive consumers about the sustainability of their flights: greenwashing is good for business. If aviation can conceal the negative environmental impact of the industry and make consumers believe that important strides are being made to green aviation, corporate reputations will be boosted and shareholders will see increased profits.

There are legitimate concerns about the true sustainability of SAFs. Even if SAFs produce fewer emissions, carbon intensive SAF production may contribute to future climate breakdown. While many questions remain surrounding SAFs, one thing is for certain: we must reduce the amount of carbon emissions dumped into the earth's atmosphere. And the best way to accomplish this is by lowering aviation demand, particularly private jet aviation demand. We must also allocate more resources to the investment of green public transportation, such as the construction of high-speed rail and bus electrification. After all, no matter how much the aviation industry tries to greenwash the skies, we cannot fly our way out of the climate crisis.

Recommendations

More independent research on the viability of sustainable aviation fuels.

One of the motivations of this report was to sift through the various pronouncements and claims around SAFs and to discern whether there is a viable path forward for non-fossil fuel sources to power large aircraft. The phrase "sustainable aviation fuels" is a popular marketing slogan with as much meaning as "natural food." You still need to look closely at the ingredients. We need additional independent research, not funded or controlled by the private aviation industry, the ethanol sector, or other self-interested sectors, on the different fuel options under the SAF umbrella, and on the feasibility and climate impact of SAF production. If models demonstrate that SAF production can potentially harm our climate goals, the resources demanded by the aviation

industry should instead be allocated towards the scaling up of green infrastructure and transportation.

Reject the inclusion of ethanol-based fuel as a SAF.

Due to the lobbying efforts of the ethanol industry, the Biden administration is reworking the models used by the federal government to determine eligibility for sustainable aviation fuel tax credits. Rather than manipulate scientific models to ensure that the life cycle emissions of ethanol are arbitrarily reduced, the administration should rely on the thorough methodology it has already recognized and which was developed by the International Civil Aviation Administration. Under this methodological standard, because of the impact of direct land use changes, ethanol's life cycle emissions would preclude it from being designated a truly sustainable fuel.

More severe penalties for greenwashing/false advertisement.

False and deceptive advertisements on the sustainability of their airline or flight should be heavily penalized. The UK-based Advertising Standards Authority (ASA) banned deceptive advertisements by Air France, Etihad, and Lufthansa.[51]

Ensure private jets pay their real costs: Increase private jet fuel taxes.

Private jets should pay their real social and environmental costs instead of requiring taxpayers and commercial flyers to subsidize their activity. An increase in taxes on private jet fuels would ensure that private jets pay their fair share, disincentivize jet use, and reduce carbon emissions, while raising revenue to cover costs of climate transition. Legislation introduced by Senator Ed Markey (D-MA) and Representative Nydia Velázquez (D-NY), the Fueling Alternative Transportation with a Carbon Aviation Tax Act of 2023 (FATCAT Act), will precisely do this.[52] The proposed legislation will increase the excise tax on jet fuel by 786 percent, from 22 cents per gallon to $1.95. This will add an estimated $200 per ton of carbon emitted by a private jet flight. Markey's plan to increase the excise tax on private jet fuel is estimated to generate more than $1.8 billion annually, which could be invested into transit alternatives.[53]

Institute a "short hop" surcharge for private aviation.

Even though there is no universal definition for a "short hop" journey, we consider any private jet operation under 210 miles to be a short hop flight. We recommend establishing a progressive tax regime that levies a significant surcharge on this activity. The shorter the flight, the higher the surcharge rate, especially if there are public transportation options available. The purpose of this tax is not to raise significant revenue, but to create a disincentive for private flying across a very short distance, reduce emissions, and use battery powered aircraft.

Ban short hop flights.

An outright ban on short hop flights would preempt carbon emissions from private aircraft flying short distances. France recently implemented a ban on short hop flights when there is a train to the destination that takes less than two and a half hours.[54]

Levy a transfer tax on private jet sales and resales.

We recommend a transfer tax of 10 percent on all preowned aircraft and a 5 percent tax on new private aircraft transactions. The reason for this discrepancy between the two types of aircraft is because newer models tend to be more fuel efficient. The total dollar volume of preowned and new private jets last year was $16.4 billion and $15.8 billion, respectively. This is a total of $32.2 billion. Our recommended transfer tax proposal would yield approximately $2.4 billion in revenue for 2023. This is a tax that would not be applicable to 99.9 percent of the population.

Invest in sustainable public transportation.

A significant portion of the funds raised from the private jet purchases, jet fuel consumption, and short hop flights of the ultra-wealthy should be directed towards a fund dedicated to the construction and expansion of sustainable public transportation A "Sustainable Transportation Fund" would allocate resources towards the increase of light rail, city-to-city rail, cycle tracks and bike lanes, and other non-emission burning transportation infrastructure. A short-term goal should be the electrification of our bus fleet. Buses are the backbone of the public transportation system across the country and its conversion to electric would yield immediate environmental and long-term economic benefits.

Increase transparency of private jet ownership and flying activity.

Like in other sectors of the economy, the ultrawealthy are able to exploit legal entities like limited liability companies to effectively hide their identity and conceal the ownership of their assets. There is a legitimate interest for the public and law enforcement to know the true beneficial owners of private jets. The jet-owning oligarchy benefits from the use of public goods like a taxpayer funded air traffic control system and a vast network of airports that receive federal, state, and local grants to stay operational. The public should not encounter a dead-end when looking up the beneficial owner of an LLC that has proprietorship over an aircraft. Increasing private jet ownership transparency provides the public the ability to accurately measure the climate-destroying flight activity of the ultrawealthy. If there are security concerns related to real-time reporting of jet locations, compromises could be explored that allow the data reporting to lag for a day or a week.

Eliminate tax benefits for private jets.

Aircraft from the private jet sector are marketed to the most economically privileged. Thanks to the unpopular 2017 Trump tax law, the ultrawealthy receive enormous benefits when they purchase a private aircraft and have the ability to write-off their jet as a business expense.[55] The business aviation industry lobbied in favor of the legislation and the NBAA set an institutional record by spending nearly $4 million in lobbying funds that year.[56]

One of the tax subsidies the private jet lobby won was a bonus depreciation provision for qualified assets that enabled private jet owners who use their jets for business to immediately realize the benefits of depreciation — that is, they could write off 100 percent of the cost of a used or new jet in the year of purchase, instead of depreciating the aircraft over the (also exaggerated) IRS standard of five years.[57] (In 2013, President Barack Obama attempted to extend private jet depreciation to seven years to match that of commercial airliners, but faced vigorous opposition from the private jet lobby.[58]) While the bonus depreciation provision began to phase out in 2023, it is still rather generous until 2027, when traditional depreciation rules will once again apply.[59]

In early 2024, the IRS announced increased scrutiny of private jets written off as business expenses, an effort largely possible due to additional IRS funding authorized in the Inflation Reduction Act of 2022.[60] The IRS should continue to prioritize audits of ultra-high net worth taxpayers, especially those who deducted the full cost of a private jet.

The overall Tax Cuts and Job Act of 2017 will expire in 2025 and any private jet tax breaks should not be renewed.

Stop new private jet expansion and infrastructure projects.

Our goal is to reduce the demand for private jet flight activity. For that reason, we demand the termination of all new construction projects designed to serve private jets. More private jet infrastructure incentivizes private jet usage to the detriment of the environment. At the time of writing, a citizens' grassroots campaign in Massachusetts is working to block the expansion of Hanscom Field (KBED), the region's largest general aviation airport in the region.

Glossary

Biofuel: fuel developed from organic materials rather than from fossil fuels.

Biogenic: originating from living organisms.

Biomass: material from living organisms that is used for fuel.

CORSIA: The Carbon Offsetting and Reduction Scheme for International Aviation; global, market-based aviation deal developed by the ICAO to offset carbon emissions.

FAA: Federal Aviation Administration.

Feedstock: raw material used in an industrial process; biofuel feedstocks are biogenic materials used to produce fuel.

GREET: The Greenhouse gases, Regulated Emissions, and Energy use in Technologies model for estimating life cycle greenhouse gas emissions.

IATA: International Air Transport Association.

ICAO: International Civil Aviation Organization; United Nations specialized agency that oversees international civil aviation.

IIJA: Infrastructure Investment and Jobs Act of 2021, also referred to as the Bipartisan Infrastructure Law; authorized $1.2 trillion for infrastructure spending.

Nature-Based Solutions: practices that incorporate natural processes into sustainable planning and design, especially in order to build resilience against climate change.

Learn More

Suggested Videos

The Economist, Can flying go green?, an eight-minute video on the different strategies currently deployed to decarbonize aviation. It looks at the viability of hydrogen-fueled aircraft and sustainable aviation fuels.

Financial Times, Can sustainable aviation fuel clean up flying?, a seven minute video produced in March of 2023 on the promises and challenges of SAFs in greening aviation.

For Further Reading

Stay Grounded: global activist network campaigning for alternatives to aviation in light of climate change. https://stay-grounded.org/

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Our Previous Reports on Aviation

High Flyers 2023: How ultra-rich private jet travel costs the rest of us and burns up the planet by Chuck Collins, Omar Ocampo and Kalena Thomhave. May 2023.

Hanscom High Flyers: Private jet excess doesn't justify airport expansion by Chuck Collins, Omar Ocampo, Kalena Thomhave and Jiaqin Wu. October 2023.

Relevant Charts

Figure 1. Business Flight Operations

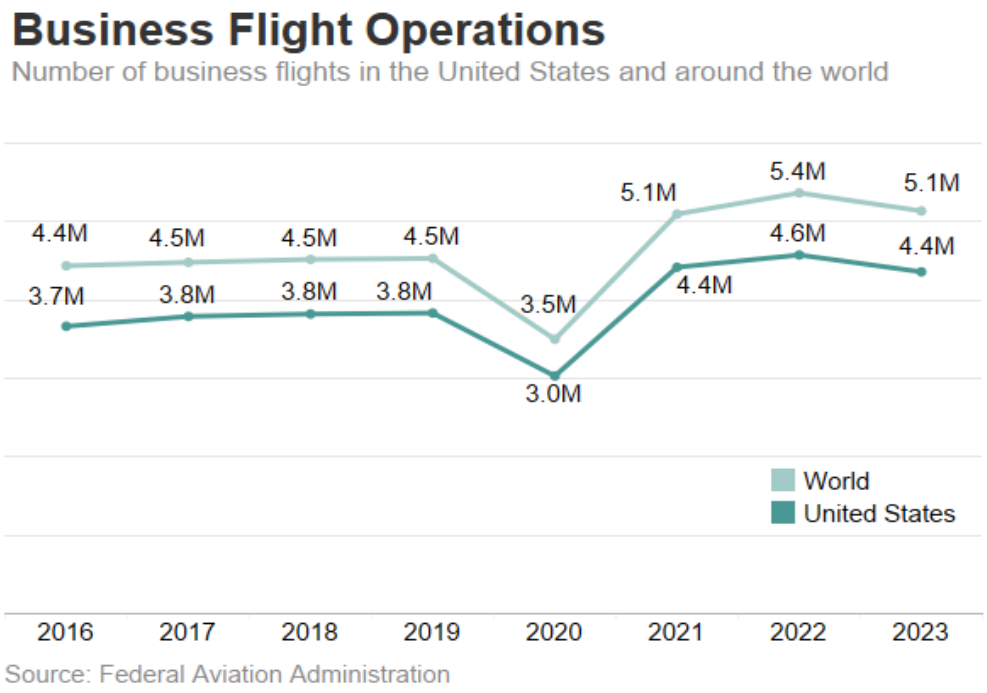

Figure 2. Global Business Jet Sales

Global Business Jet Sales, 2019-2023

All sales and revenue amounts are shown in the billions of dollars

Year	Pre-Owned Jet Sales	New Jet Sales	Total Jet Sales
2019	$11.4	$16.9	$28.3
2020	$11.8	$14.2	$26.0
2021	$16.7	$15.6	$32.3
2022	$20.3	$16.1	$36.4
2023	$16.4	$15.8	$32.2

Source: IPS analysis of data from Global Jet Capital

Figure 3. U.S. Jet Fuel Consumption

U.S. Jet Fuel Consumption, 2016-2023

Year	Gallons of Jet Fuel Consumed	Gallons of SAF Jet Fuel Consumed	Market Share of SAF Jet Fuel
2016	17,138,000,000	1,900,000	0.01%
2017	17,662,000,000	1,700,000	0.01%
2018	18,325,000,000	1,800,000	0.01%
2019	18,746,000,000	2,400,000	0.01%
2020	11,067,000,000	4,600,000	0.04%
2021	14,617,000,000	5,100,000	0.03%
2022	17,510,000,000	15,800,000	0.09%

Source: IPS analysis of data from Environmental Protection Agency and Bureau of Transportation Statistics via the Governmental Accountability Office

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