Jetting away with it

How private jets pollute the most and pay the least

July 2023

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Inspiring climate action

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Possible is a UK based climate charity working towards a zero carbon society, built by and for the people of the UK. Our A Free Ride campaign aims to protect access to reasonable levels of flying for the less well-off, whilst maintaining aviation emissions within safe limits for the climate.

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Contents

Executive Summary

- We assessed the recent growth in the private jet flight market since the pandemic hit, along with the Air Passenger Duty (APD) paid on these flights. We compared the APD levied to the emissions caused by private jets, and used this to produce values for the implicit rate of tax paid per tonne of emissions on private jet flights. We then compared this to the equivalent effective rate of tax per tonne of emissions for seats on ordinary commercial flights.
- We also investigated the claims companies offering private jet flights are making to their customers about what they are doing to tackle their emissions.
- We found that the UK private jet market has seen explosive post-pandemic growth, such that one in ten flights departing UK airports are now private jet flights. During the early months of the pandemic this proportion increased to nearly one in four flights.
- The pandemic did little to inhibit the ability of private jet users to travel abroad on holiday. After an initial two months of disruption, private jet flights to holiday destinations rebounded rapidly.
- During winter, airports with easy access to the Alps account for around one in four departures from Farnborough, the UK's largest private jet airport. In the peak skiing month they account for one in three departures. During summer, flights to destinations around the Mediterranean spike, such that more than half of departing flights from Farnborough in the busiest months are to Mediterranean airports.
- **Passengers on just over one in five private jets and turboprops (the propeller-driven equivalents of private jets) departing UK airports pay no APD (because their flight is on a plane that is lighter than the 5.7 tonne threshold).**
- **On slightly more than half of private jet flights the passengers pay the same APD as premium economy passengers. This means that only around a quarter of private jets carry passengers paying the highest rate of APD, while three quarters of private jet passengers pay**

the same APD as premium economy passengers or pay no APD at all.

- Private jets fly at very low occupancy rates, with an average passenger load of 2.5 to 2.8. This includes the very largest and most carbon-intense categories of private jet, with **the average number of passengers on a larger private jet departing from the UK being just two or three people when empty return journeys are included. This represents a load factor (the percentage of seats occupied) of less than 20%, with about as many crew members carried as passengers.**
- **The fact that even large aircraft are being operated at such low average load factors points to flights on larger private jets being as much as 20 or even 30 times more carbon-intensive than economy class airline flights.**
- **We found that, under the APD system, the more polluting an individual's flight is, the lower the effective rate of tax per tonne of emissions.** First class passengers pay less per tonne of CO_2e emissions than business class passengers, who pay less per tonne of CO_2e than economy class passengers. Private jet passengers pay the lowest rate of all in proportion to the environmental damage that they cause. This is because the higher rate of APD is set at a very low level compared to the emissions from private jet flights.
- For example, a passenger flying from London to Edinburgh in economy on a standard commercial flight would pay an implicit carbon price of £43 per tonne of emissions. Someone making the same journey by private jet would pay the equivalent of just £20 per tonne if they travelled in a large jet, £6 per tonne in a medium sized private jet, and nothing at all for a flight in a small private jet.
- For a flight from London to New York, the implicit carbon price per tonne of emissions is £96 for a passenger in economy class, £72 for a business class passenger, and just £52 for a first class passenger. A passenger making the same flight by private jet would pay just £13 per tonne in a medium size private jet and £24 in a large private jet.
- In addition, the rate of tax levied on private jet flights compared to the cost of those flights is much lower than that on ordinary passengers. Our calculation of **the proportion of a private jet ticket price which is paid in tax for an example route between London and Paris is**

that it is less than 2%, which is an order of magnitude smaller than the effective rate of tax paid on the ticket price of ordinary flights (43% for economy class and 23% for business class).

- No private jet operators (out of 78 emailed) responded to questions from Possible about future electric aircraft use and plans to reduce emissions from private jet flights.
- However, a large number did respond to inquiries posed as from a potential customer, rather than a climate charity.
- Our analysis of responses from private jet companies to these inquiries found that the claims they make about offsetting lack a realistic assessment of these schemes' ability to reduce emissions.
- Alternative fuels are not available for the majority of private jet flights, with confusion and contradiction across private jet companies about these fuels' content, effect and availability.
- Some private jet companies actively promote their flights as "guilt-free flying" and "carbon neutral", despite their sky-high emissions.
- Some operators offer unnecessarily large aircraft for flights for a small number of passengers, despite this producing much higher emissions.

Policy recommendations

Policies are needed to rapidly reverse the growth trajectory of emissions from private jets. Unless taxes are levied at a suitably high rate, they will have only a minimal impact on reducing demand for private jet flights, which by their nature are bought by the wealthiest in society.

Electric planes are not currently available on the market to replace private jet flights, and the aviation industry's track record of delivering on its promises to reduce emissions is extremely poor.[1] However, due to the small number of passengers and short distance of a typical private jet flight - along with the exceptionally high access to capital and finance enjoyed by the typical private jet passenger - private jet flights are some of the most feasible to be replaced by electric (or hydrogen fuel cell powered) aircraft. The aerospace sector has indicated that it is capable of developing such zero emissions craft, which may be the optimal future technological solution for short haul air travel, especially with low passenger numbers. Yet this will not happen unless there are policy and regulatory changes to send a strong signal to the market and create incentives for investment into, and development and delivery of, small electric aircraft. **This means setting an early ban date for kerosene-powered private jets, and the immediate introduction of taxes which reflect the real cost to the climate - and hence to all of us - of these flights.**

We therefore call on the government to take the following steps:

- **Set an early date for the end of the sale of private jets and private jet flights powered by kerosene in the UK. At the absolute latest, there should be no more private jets powered by liquid fuels using UK airports by 2030.**
    - By providing regulatory certainty today, policymakers can accelerate the time to market for small electric passenger jets.
- **Until the phase out takes effect, start taxing private jet flights at an appropriate rate that is more proportional to their incredibly high emissions (and high cost).**
    - **Ensure that all private jet and turboprop passengers are paying at least the highest rate of APD, reflecting their high emissions.**

- **This should be accompanied by the introduction of a new super-high rate for larger and even more polluting private jets.** These APD rates should apply to all private jet flights, both to passengers chartering a private jet flight and planes flown by their owners. The Higher Rate should be increased and the super-high rate set sufficiently high to reflect the emissions caused by these flights, which we calculate to be up to 20 or 30 times higher than standard flights.
- **The new APD rates should be accompanied by a tax on jet fuel, set at a rate which is appropriate for its environmental impact and to drive change in the industry - and which is sufficiently high to discourage the use of large planes for small numbers of passengers.**
- **End the 0% VAT rating on flights.**

Various options exist for how to more effectively and fairly tax private jets,[2] but it is clear that the current system is not delivering outcomes which are in the public interest. The current APD banding framework entirely exempts small private jets from tax, while flights in medium sized private jets are taxed at the same rate as tickets on standard flights despite being much more polluting (and expensive). Even for the one in four private jet flights which do pay the highest rate of APD, this rate is far too low for this ultra high-emission mode of transport.

However, APD alone will not address the very low load factors for private aviation, or disincentivise the industry or its customers from putting only a few passengers on a large, otherwise empty aircraft. Ideally, the APD levied would increase in proportion to the cost of the flight, but APD is a blunt instrument which is not designed to effectively or proportionately tax the very high emissions produced by private jets. These changes would therefore be only a short-term solution until fossil-fuelled private flights are grounded for good.

Whilst a frequent flyer levy is the most appropriate fiscal approach to managing demand for passenger flights overall within safe limits for the climate in a way that supports the principles of a just transition, private jet travel is a special case. **We designed the frequent flyer levy policy proposal to protect access to occasional air travel for ordinary people. However, there is no rationale to protect any access to private jet flights.** We therefore do not suggest any tax free first flights for private jets.

Preface

This report is our second foray into the world of private jets. The first, "Jet, Set, Go: The case for electric-only private jet flights from 2025",[3] reviewed the UK market, estimated the emissions generated by private jets operating out of the UK, and proposed the introduction of a ban on the use of fossil fuel-powered private jets in favour of electric aircraft.

This call for a ban has subsequently been taken up by others including Transport & Environment[4] and Greenpeace[5], and other organisations such as the Campaign For Better Transport[6] and Green Alliance[7] have also called for urgent reform of the uniquely generous fiscal treatment of this elite form of ultra high carbon transport.

The urgency of tackling the climate crisis has never been clearer. In summer 2022, the UK saw temperatures so hot that runways melted. Around the world, increasingly extreme heatwaves, droughts, floods, crop failures, storms and wildfires are harming people who will never set foot on any aeroplane, let alone a private jet.

Aviation is a sizeable contributor to the UK's emissions, but its benefits are deeply unequal. Most people fly rarely if at all, with just 15% of the population who fly most often taking 70% of all the flights.[8] And private jets are most unequal of all. Each of the small group of ultra-wealthy people who fly on the largest private jets produce as much as 20 or even 30 times more emissions than passengers in economy class on standard commercial flights, which are themselves many times more polluting than train travel. As this report finds, the taxes currently applied to private jet flights are far too low to reflect the harm they cause to our climate, or to disincentivise this grotesque waste of emissions at a time of climate emergency.

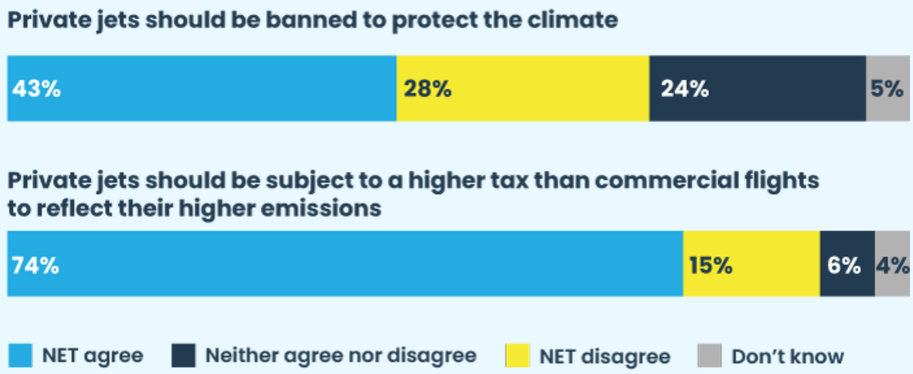
Constraints on demand are required across aviation if the sector is not to burst the UK's carbon budgets. This must include a progressive tax such as the frequent flyer levy, to target reductions in demand for flights at people who fly the most. However, frequent flyers who take standard flights might reasonably expect that private jet flights, which are much more polluting and less socially beneficial, would not still be unlimited and virtually untaxed. Our work here finds that each avoided private jet flight would save more carbon than 20 or 30 avoided flights by passengers in economy class, so it is clear that demand management policy to achieve climate goals must include this market segment if it is to be efficient and effective.

Moreover, if the transition to a low-carbon economy is to maintain the public support it needs, it must be seen to be fair. This means that it is essential for cuts to be targeted at those emissions which are most wasteful and least beneficial. It is hard to imagine a better place to start targeting excessive emissions than private jets, which often depart with just one or two passengers sitting in a huge, virtually empty plane, which then flies its return journey with no passengers at all.

Public views on private jets

We commissioned polling[9] of the UK public to ask for their views on private jets, in view of private jets producing much more emissions than ordinary flights but not being taxed to reflect that. We found that 43% of people thought that private jets should be banned to protect the climate, with just 24% disagreeing. 74% agreed that private jets should be subject to a higher tax than commercial flights to reflect their higher emissions, with just 6% disagreeing.

Figure 1: Public views on whether private jets should be banned or taxed more highly.



Evolution of the UK private jet and turboprop market

The data which underpins this section of the report is drawn from Eurocontrol's STATFOR database[10].

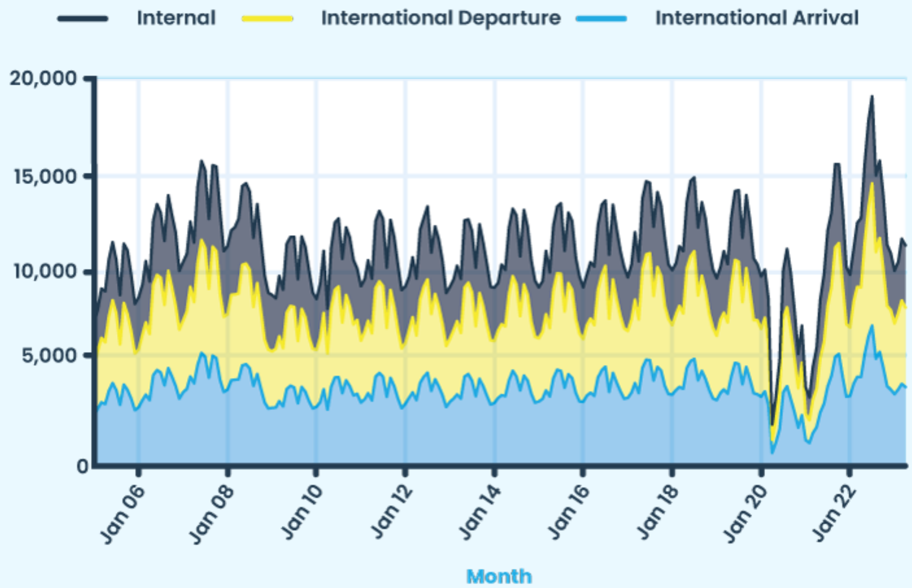
This platform contains aggregated records of aircraft movements arriving into, flying within and departing from European airspace. It contains departure, arrival, internal and overflight (DAIO) movement data by market segment at state level, along with departure and arrival data at airport level, information about aircraft types and flight origins and destinations. As such it offers the most complete picture of private jet and turboprop movements available.

Since 2005, the UK private jet and turboprop market has experienced three periods of growth, interspersed by two periods of decline (Figure 1).

The first period of growth was seen during the 2000s, with rapid, double digit increases in 2006 (+19%) and 2007 (+15%). When the global financial crisis struck the sector contracted 7% in 2008 and a further 16% in 2009.

For the next decade the trend switched to a more gradual growth trajectory, which ended in March 2020 when the start of the pandemic saw the first lockdown.

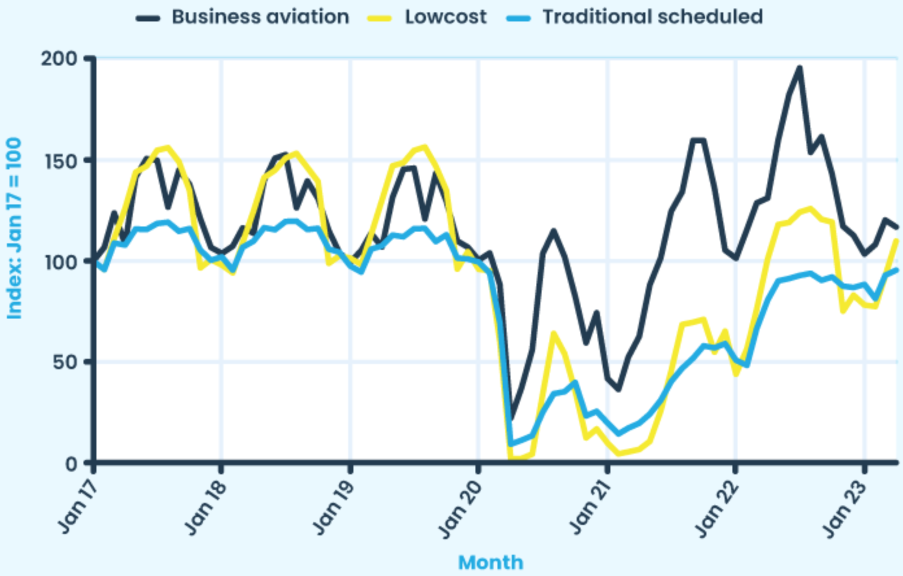
Figure 2. Private jet and turboprop plane movements to and from UK destinations since 2004.



In April 2020, private jet and turboprop flights were down by 79% compared with April 2019, but by August flight numbers had staged a rapid recovery to be just 5% lower than the same month in 2019. In the latter half of 2020, private jet and turboprop traffic fell back once more before staging an extraordinary recovery through the spring and summer of 2021, and then following this up with never-before-seen traffic levels in 2022.

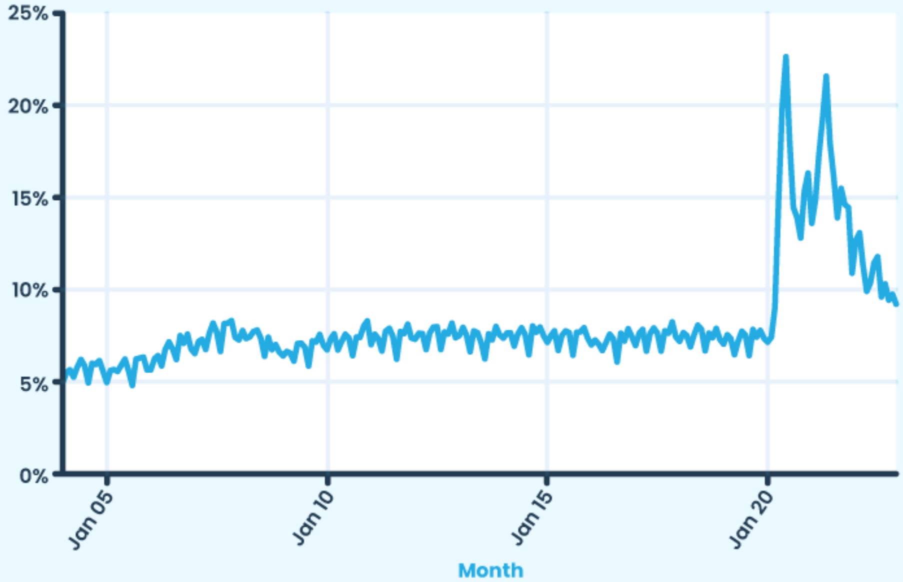
This contrasts sharply with the fate of the low cost and traditional scheduled flight market segments. These saw a 98% and 90% reduction in flight numbers at the start of the pandemic, and have seen a much more gradual recovery (and are still below pre-pandemic levels):

Figure 3. UK passenger flights by market segment (indexed: Jan 2017 = 100).



During the period 2010 to 2019, private jet and turboprop flights made up an average of 7.5% of all UK flight departures. As the pandemic hit and the passenger airline industry shut down, this proportion surged to close to one in four departures being private jets and turboprops, and it is only recently that this proportion of departing flights has dropped back to one in ten:

Figure 4 Proportion of UK departures by private jets and turboprops.



Seasonal variations in private jet travel

A popular impression of private jet travel is that it primarily exists for business people to move around the world easily, negotiating important business agreements and generating economic growth.

The sector is known within the aviation industry as the "business aviation" sector, a term that is a hangover from its early decades (from the 1960s onwards), when the aircraft were indeed squarely aimed at large corporations, the only entities with enough wealth to own and operate them.

In more recent decades there has been substantial growth in aircraft management and fractional ownership services, which allow individuals and companies to book private jet flights without having to buy their own plane. This has widened the market for private jets well beyond their original corporate focus. Now, rather than having to own a private jet outright, customers can purchase a subscription which grants access to a certain number of flight hours per month. Alternatively, they can simply charter a jet for one-off journeys.

This increasing accessibility of private air travel has also been eagerly taken up in the UK's political sphere, both on aircraft operated by the RAF but converted into private jet configuration,[11] and also on aircraft supplied at considerable cost by third parties.[12]

In spite of the Ministerial Code insisting that "ministers must ensure that they always make efficient and cost-effective travel arrangements",[13] the UK's ministers past[14] and present,[15] as well as prime ministers past[16] and present,[17] have been making extensive use of private jets in recent years.

The extent to which private jets are operated for business versus leisure is not tracked by any agency so good quality data is not readily available, but a seasonal analysis of aircraft destinations gives a very firm indication that the very wealthy often use private planes when jetting off on holiday.

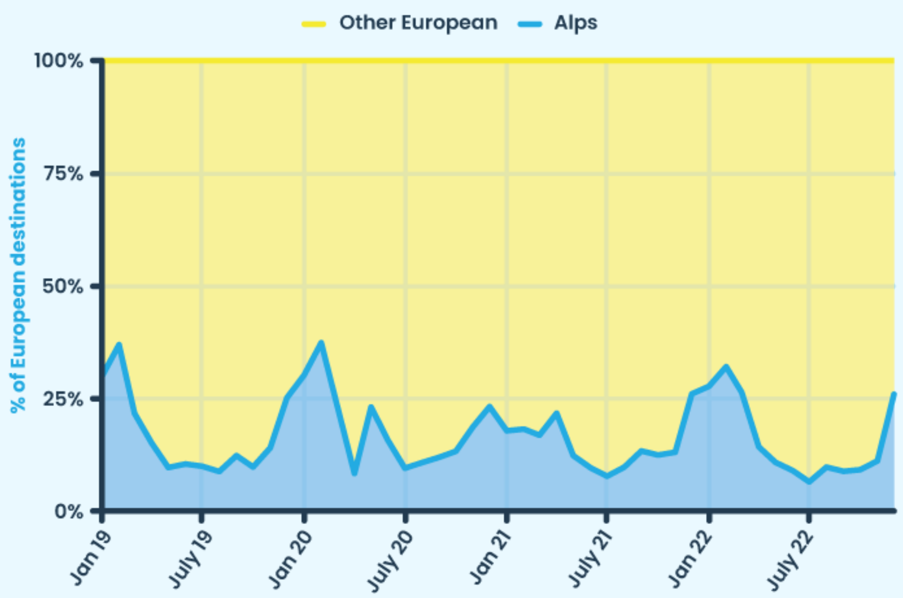
The STATFOR[18] destination data is broken into granular regions known as 'origin-destination zones' and even down to the level of individual airports, allowing us to build up a set of destinations to estimate what contribution these more leisure-oriented locations make to the total demand for international flights to Europe from the UK.

Table 1. Seasonal destination analysis region definitions.

Region	Coverage
Alps	Geneva, Zurich, Chambery, Grenoble
Western Mediterranean	Barcelona, Balearic Islands, Seville
Eastern Mediterranean	Croatia, Cyprus, Greece, Italy, Malta, Turkey
French Riviera	Avignon, Cannes, Nice, Hyères, Marseille
Other European	Remaining non-UK European Civil Aviation Conference (ECAC) destinations[19]

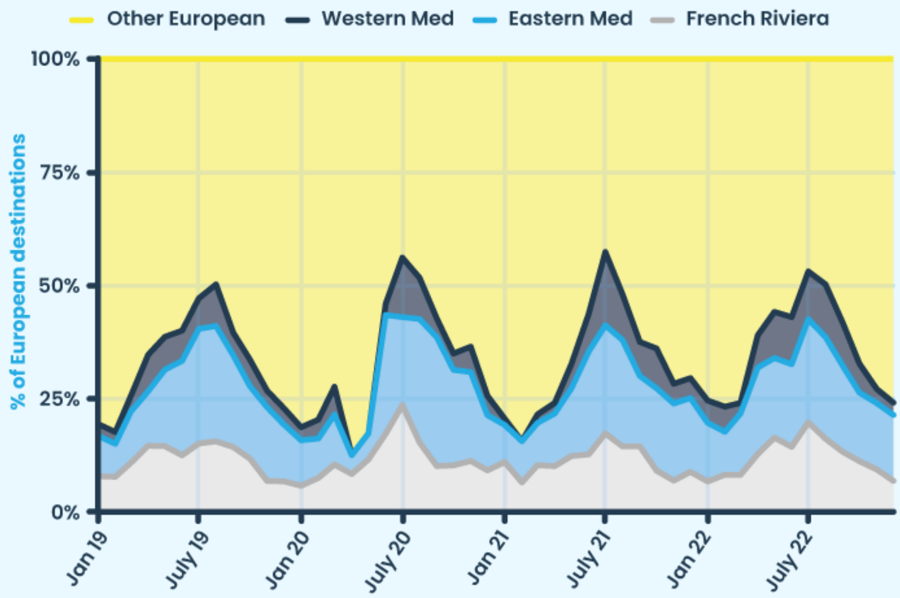
The results show pronounced seasonal variations. During the winter Alpine airports are very popular European destinations, accounting for over one in four departures from Farnborough between December and March and around one in three departures in the peak month, February, as shown in Table 4.

Figure 5. Share of departures to Alpine destinations as a percentage of total departures to European destinations from Farnborough.



During the summer, Mediterranean destinations dominate, accounting for more than 40% of European destinations from April to September and peaking at more than 50% of flights in July:

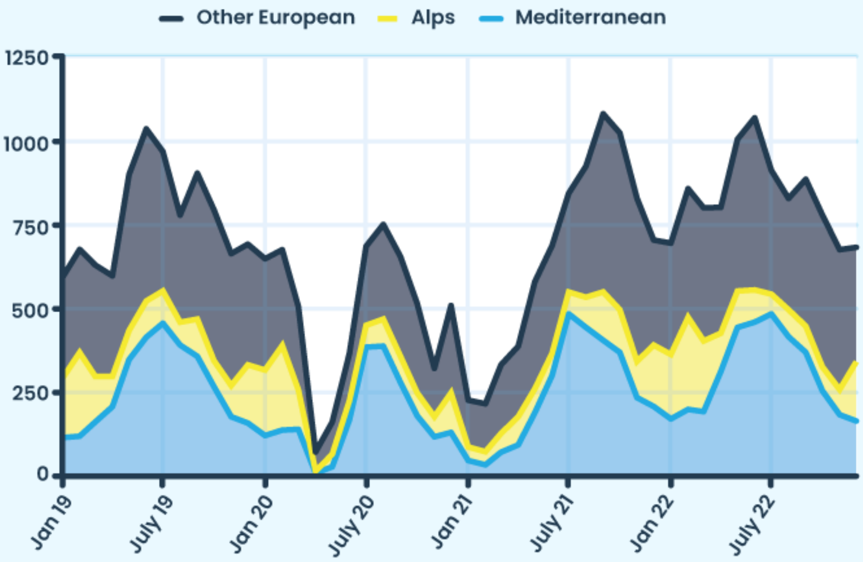
Figure 6. Share of departures to Mediterranean destinations as a percentage of total departures to European destinations from Farnborough.



It is notable that, other than during April and May of 2020, the pandemic did little to dent the holiday aspirations of private jet users. Even during summer of 2020, as the full reality of the pandemic was well understood, half of private jet flights out of Farnborough were making their way to the Mediterranean.

While the total number of flights by private jets and turboprops was lower in 2020 than 2019, flights to Mediterranean destinations in July 2020 were only 15% lower than the peak in the same month in 2019 (in contrast, total low cost flights in summer 2020 peaked about 60% lower than the 2019 peak, suggesting that ordinary people cut back on summer holiday travel significantly more than private jet passengers did):

Figure 7. Monthly flights to European destinations from Farnborough.



This data suggests that a sizeable proportion (at least) of private flights are for leisure purposes, not business, belying the "business aviation" description formally applied to the private jet market. Furthermore, these widely popular routes are also well served by standard passenger flights, not to mention good train services.

Air Passenger Duty and private jet taxation

An Overview of Air Passenger Duty

Air Passenger Duty (APD) is a tax on each passenger departing from the UK. The tax is split into four 'Destination Bands':

Table 2. Air Passenger Duty Destination Band definitions.

Destination Band	Distance	Example Destinations
Domestic	-	All airports in England, Scotland, Wales and Northern Ireland (does not include Isle of Man or Channel Islands)
Band A	Up to 2,000 miles	EU & EEA, Canary Islands, Morocco, Libya, Turkey, Russian Federation (West of Urals)
Band B	2,001 to 5,000 miles	USA, Canada, Brazil, Russian Federation (East of Urals), India, China, Middle East, sub-Saharan Africa (excl South Africa, Mozambique, Madagascar)
Band C	5,001 miles and up	Mexico, Argentina, South Africa, Mozambique, Japan, Thailand, Indonesia, Australia, New Zealand

The final destination on a passenger's ticket defines which APD band the flight falls into.

In addition to the Destination Bands there are also three 'Rate Bands', which are defined by the seating class:

Table 3. Air Passenger Duty Rate Band definitions.

Rate Band	Rate Definition
Reduced	Travel in the lowest class of travel available on the plane on a seat with a pitch[20] of <1.016m
Standard	Travel in any other class of travel or if the seat has a pitch of >1.016m
Higher	Travel in planes with a maximum take-off weight (MTOW) of 20t or more and equipped to carry <19 passengers

Not all people flying in aircraft have to pay APD as there are a number of exemptions, including:

- Flight crews and cabin attendants
- Children under two years without a seat
- Transit passengers and passengers on connecting flights
- Humanitarian, emergency medical, research or training flights
- Short pleasure flights
- Passengers on flights departing from airports in the Scottish Highlands and Islands region
- Passengers on aircraft with a maximum take-off weight (MTOW) of up to 5,700kg

APD and private jets

The implications of Air Passenger Duty's structure on private jet and turboprop operations is that most private jet passengers pay the Standard Rate of APD (the same rate as is paid by a Premium Economy passenger on a conventional flight), some pay the Higher Rate and many pay no APD at all:

Table 4. Air Passenger Duty Rate Bands for different private jets and turboprops.

Private Jet Category	**Example Types**	**Rate Band**
Very Light and certain Light Jets and Turboprops	Cessna CJ1, CJ2, Mustang Embraer Phenom 100 Eclipse 500 Piaggio Avanti Pilatus PC-12 Beechcraft King Air 90	Exempt
Midsize and Super Midsize Jets and Turboprops	Cessna CJ3, CJ4, Citation X Bombardier Challenger 300 Embraer Legacy 450, 500, Phenom 300 Dassault Falcon 2000 Learjet 40, 45, 60, 75 Pilatus PC-24 Beechcraft Super King Air 350	Standard
Large Jets and Heavy Jets (MTOW >20t, <19 seats)	Bombardier Global 5000 Embraer Legacy 600 Dassault Falcon 900, 7X, 8X Gulfstream IV, V, 500, 600	Higher

There is a further category of private jets, known as Bizliners, which are airliners such as the Airbus A320 series, Boeing 737 series and a number of Embraer regional airliners which are converted into luxury private jet configurations. These aircraft comfortably exceed the threshold of 20t maximum take-off weight and can easily be fitted with more than 18 passenger seats, which would move them into the same APD category as conventional airliners and the APD levied would therefore revert to the normal Standard Rate.

It is not known the full extent to which private jet passengers contribute to APD as HMRC's Air Passenger Duty Bulletin[21], the sole source of public statistics concerning APD receipts and passenger numbers, does not disaggregate the revenues between commercial airlines and private jet operators.

The APD Bulletin gives total receipts from APD, along with passenger numbers by Distance Band (Bands A and B only for recent years, as the Domestic Band and Band C were only introduced in April 2023).

While private jet passengers paying the Standard Rate APD are combined with the Standard Rate commercial passengers in this data set, it is possible to quantify the number of private jet passengers paying the Higher Rate. Curiously this number is not explicitly given in a separate column, but it can be calculated by deducting the number of Band A and Band B passengers from the total number of passengers paying APD.

An analysis of STATFOR departure data by aircraft type for the top 10 private jet airports in the UK allowed us to estimate what percentage of private jets fall into each APD Rate Band.

We were able to identify the aircraft type on over 45,000 departures in the financial year 2021/22, representing more than half of all departures by private jets and turboprops from UK airports. By applying typical maximum take-off weights to each type (using data sourced from Eurocontrol's Aircraft Performance Database)[22] it was possible to allocate each of these flights to an APD Rate Band.

This large sample breaks down as one in four flights (26%) being made in aircraft which have an MTOW of more than 20 tonnes and fewer than 19 seats, which fall into the Higher Rate APD band. Half the flights (52%) are made by aircraft that have an MTOW of between 5.7t and 20t and fall into the Standard Rate band. One in five flights (22%) are made in private jets and turboprops with an MTOW of below 5.7t, which pay no APD at all.

Other taxation

In common with most of the aviation sector, private jet operations are barely taxed at all.

Fuel Duty - The lack of any duty or VAT on aviation fuel used for international travel dates back as far as the Chicago Convention of 1944.[23] Contrary to what is often assumed, this does not prohibit tax being placed on fuel uplifted on departing aircraft.[24] Duty and VAT could in theory be levied on fuel used for domestic flights but in practice (with a very few exceptions[25]) isn't.

VAT on Aircraft, Maintenance & Equipment - If the operator is "an airline operating for reward chiefly on international routes"[26], as the vast majority of private jet operators will be, then the aircraft it purchases or leases, as well as any maintenance or equipment, are all zero-rated for VAT.

Before 2011, any aircraft of 8,000kg MTOW or greater were zero-rated for VAT, as long as it was not configured for recreation or pleasure. This loophole was an interpretation of an EU directive which was aimed at zero-rating aircraft for airlines, but in the UK led to increasing numbers of private jets being purchased, VAT-free by businesses or individuals, for private use within the European Union.[27] The loophole was closed in 2011 and now the test for VAT status falls on the operator rather than the aircraft.

VAT on International Flight Tickets - International journeys which begin or end in the UK are zero-rated for VAT.[28]

VAT on Domestic Flight Tickets - Domestic journeys in aircraft with more than 10 seats (including crew seats) are also zero-rated.

It does not make sense for flights to be zero-rated for VAT, particularly private jet flights. Other items which are zero-rated include essentials such as baby clothes, wheelchairs and cycle helmets.

Spot the odd one out:

Which of these goods and services shouldn't pay zero VAT?

Private jet passenger load estimates

Very little concrete data on passenger numbers being carried in private jets is publicly available. This data is vital as it enables the quantification of the emissions impacts per passenger, which can then be compared to conventional flight emissions.

The APD Bulletin offers a rare glimpse into the actual number of passengers flying in a distinct, well-defined subset of private jets: the very top end of the private jet market, made up of aircraft with a maximum take-off weight of 20 tonnes or more and fitted with up to 18 seats.

In order to estimate average passenger loads we need an estimate of the number of departures from UK airports by aircraft that fall into this category. Eurocontrol's STATFOR database[29] contains data on aircraft movements between airports, categorised by aircraft type. In an effort to reduce the chances of identifiable individuals being revealed in the data, some filtering is applied so that any aircraft type departing from a given airport less frequently than once per week is excluded from the data.

The upshot of this is that it is not possible to obtain a complete estimate of flight numbers for each type. Instead, what we end up with is a lower bound for the number of flights by Higher Rate category aircraft. When we divide the number of Higher Rate passengers by this number, it gives an estimate of the average passenger load.

Some of these Higher Rate category flights will be medical missions, some of which would not be subject to APD, but these make up a small proportion of the total private jet market[30] and these will be offset by the Higher Rate category flights which are not included in this estimate.

The APD Bulletin tells us that in the calendar year 2021/22 just over 30,000 passengers paid the Higher Rate band of APD. An analysis of STATFOR data for the top 10 UK private jet airports tells us that there were at least 12,250 departures by aircraft that qualify for the Higher Rate APD band. **This implies that the maximum average passenger load for these aircraft was around 2.5 passengers per aircraft.** This average figure includes aircraft which fly with no passengers at all, for example in order to reposition to collect passengers, known as 'empty leg' flights.

These empty leg flights are extremely common. In a report on the Economic Impact of Business Aviation[31] commissioned by the European Business Aircraft Association (EBAA), the authors stated that they obtained "proprietary data from a major Business Aviation broker which specifies an average of 4.7 passengers per Business Aviation flight as well as EBAA data indicating that 41% of all Business Aviation flights in 2014 were empty leg flights". An average passenger load of 4.7 passengers in occupied flights coupled with 41% of flights being empty leads to an average passenger load including empty leg flights of 2.8 passengers per aircraft.

Another corroborating line of evidence for estimating passenger loads comes from private jet operator Lux Aviation's sustainability report.[32] This shows that average CO_2 emissions per flight for Lux Aviation's operation are around 5.7tCO_2 and the average CO_2 emissions per passenger are around 2.2tCO_2, implying an average passenger load of 2.6 passengers per flight.

These three very different lines of evidence all point to private jets being operated at extremely low load factors.[33] In the case of the larger aircraft, which fall into the Higher Rate APD band and typically have between 12 and 18 seats, an average passenger load of 2.5 passengers per flight implies an average load factor of under 20%. Compared to commercial aircraft, which typically operate at load factors of over 80%, private jet operations are very inefficient.

Implicit carbon prices of private jets vs airliners

While the Treasury's narrow definition of what constitutes an environmental tax excludes APD[34] (a view not shared by the Office for National Statistics which does include it in their list of environmental taxes),[35] it is the sole tax levied on air travel. It is therefore illuminating to compare this tax to the emissions from flights, to provide an implicit carbon price.

The implicit carbon price is straightforward to calculate by taking the tax rate and dividing by the emissions associated with the activity being taxed, measured in tonnes of carbon dioxide equivalent to include all the greenhouse gas emissions from flights. For example, road fuel duty in the UK is currently set at 57.95p per litre,[36] and a litre of diesel generates around 3.17 $kgCO_2e$ (carbon dioxide equivalent) and a litre of petrol generates around 2.78 $kgCO_2e$ when considering the emissions from both the production and combustion of the fuel (known as well-to-wheel emissions).[37] By taking the duty rate and dividing by the greenhouse gas emissions of the fuel, we can estimate that the implicit price of carbon for fuel duty for vehicles in the UK is between about £180/tCO_2e (per tonne of carbon dioxide equivalent) and £210/tCO_2e.

We can undertake a similar exercise for APD by quantifying the emissions associated with illustrative journeys in each rate band, Domestic, A, B and C, and for each rate type, Reduced, Standard and Higher.

Each rate band covers a range of potential journey distances and an illustrative selection of short, medium and long distance journeys for each band can be found in Table 5.

Table 5. Distances for selected routes in different APD rate bands.

Rate Band	Destination	Distance from London (km)
Domestic	Newquay	340
	Edinburgh	530
	Inverness	710
A	Paris	350
	Zurich	790
	Nice	1,040
	Moscow	2,510
B	Tel Aviv	3,590
	New York	5,540
	Beijing	8,140
C	Mexico City	8,900
	Singapore	10,900
	Sydney	17,100

In Table 6 the APD rate types have been mapped to different commercial airline seating classes and different models of private jet. Also included are the APD rates[38] for each permutation:

Table 6. APD Rates for different commercial airline seating classes and private jets sizes.

APD Rate Type	Commercial Seating Class	Private Jet Type	APD Rate per Passenger			
			Domes tic	Band A	Band B	Band C
Exempt	-	Very light and light	£0	£0	£0	£0
Reduced	Economy	-	£6.50	£13	£87	£91
Standard	Premium Economy, Business, First	Midsize and super midsize	£13	£26	£191	£200
Higher	-	Large and heavy	£78	£78	£574	£601

Taking a selection of the routes listed above we can estimate the emissions associated with different classes of commercial air travel using the emission factors published by the Department for Energy Security and Net Zero (DESNZ).[39] Private jet emissions can be estimated using Eurocontrol's Small Emitters tool,[40] which calculates the fuel burn required for a given aircraft type to fly a given distance.

For this analysis we have included the greenhouse gas emissions associated with the combustion of the fuel, the upstream 'well-to-tank' emissions associated with the fuel's production and the non-CO_2 impacts of aviation[41] in order to produce an estimate of the total climate impact of the flights. This applies both to the commercial airline calculations and the private jet calculations.

Well-to-tank emissions are rarely included in flight emissions estimates produced by online carbon calculators but as these are associated with the production of the fuel used by aircraft and are non-negotiable, they are important to include when seeking to reflect the total impact of flying.

We have also used the highest of the three estimates of average passenger loads (2.8 passengers per flight) described in the previous section. This passenger load takes into account the estimated 40% of private jets which fly without any passengers at all:

Table 7. One-way emissions (tCO_2e) of selected routes from London by commercial airline seat class and by private jets of different sizes.

		Emissions per passenger (tCO_2e)					
Rate Band	**Destination**	**Economy**	**Business**	**First**	**Cessna Citation M2**	**Dassault Falcon 2000**	**Bombardier Global Express**
Domestic	Newquay	0.09	0.09	-	0.9	1.8	3.1
	Edinburgh	0.15	0.15	-	1.1	2.4	4.0
	Inverness	0.19	0.19	-	1.3	2.8	4.7
A	Paris	0.06	0.09	-	0.9	1.8	3.2
	Zurich	0.13	0.20	-	1.4	3.0	5.0
	Nice	0.17	0.26	-	1.7	3.6	6.1
	Moscow	0.41	1.2	1.7	-	7.1	12.0
B	Tel Aviv	0.59	1.7	2.4	-	9.6	16.5
	New York	0.91	2.6	3.6	-	14.3	24.4
	Beijing	1.3	3.9	5.4	-	20.5	35.1
C	Mexico City	1.5	4.2	5.8	-	-	38.1
	Singapore	1.8	5.2	7.1	-	-	46.2
	Sydney	2.8	8.1	11.2	-	-	71.2

It is worth noting the extent to which private jet travel is more carbon-intensive than conventional aircraft. Previous analyses (including our own[42] and those of Transport & Environment[43]), have estimated that private jet travel is in the order of five to 15 times more carbon-intensive than airline passengers, but these were based either on generous passenger load assumptions or smaller aircraft.

The fact that larger aircraft are being operated at such low average load factors points to small private jet flying typically being 10 times as carbon-intensive as economy class airline passengers, while larger jets can be 20 or even 30 times as carbon-intensive (and in some specific cases even more carbon-intensive than that).

Where first class seats are not available (e.g. on domestic or short haul European flights), and where routes are excessively long for the type of private jet, these have been left blank.

By taking the APD costs detailed in Table 6 and dividing by the emissions estimates in Table 7 we can calculate the implicit carbon price imposed by APD:

Table 8. Implicit carbon prices (£/tCO_2e) of selected routes by commercial airline seat class and private jet.

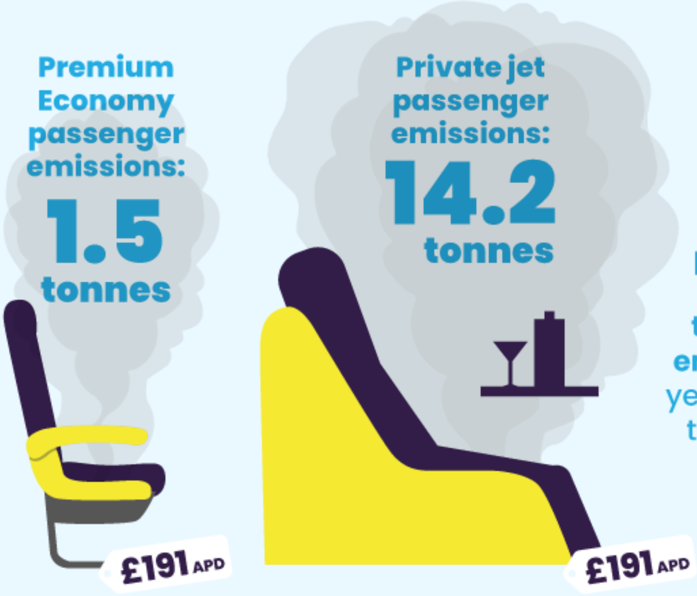
		Implicit carbon price (£/tCO_2e)					
Rate Band	**Destination**	**Economy**	**Business**	**First**	**Small private jet, e.g. Cessna Citation M2**	**Medium size private jet, e.g. Dassault Falcon 2000**	**Large private jet, e.g. Bombardier Global Express**
Domestic	Newquay	£72	£144	-	£0	£7	£25
	Edinburgh	£43	£87	-	£0	£6	£20
	Inverness	£34	£68	-	£0	£5	£16
A	Paris	£217	£289	-	£0	£14	£25
	Zurich	£100	£130	-	£0	£9	£15
	Nice	£76	£100	-	£0	£7	£13
	Moscow	£32	£22	£16	-	£4	£6
B	Tel Aviv	£147	£112	£81		£20	£35
	New York	£96	£72	£52		£13	£24
	Beijing	£65	£49	£36		£9	£16
C	Mexico City	£62	£47	£34		-	£16
	Singapore	£51	£39	£28		-	£13
	Sydney	£33	£25	£18		-	£8

A number of things stand out in Table 8. Firstly, there is a substantial range of implicit carbon prices within rate bands. This is because APD has a crude structure, carving up the world's countries into four distance bands (domestic plus three international bands) and then applying a fixed duty, depending on the seating class, to all destinations within each band. So a ticket to Paris, one of the closest capitals to London, has the same duty levied on it as a ticket to Moscow, a city which is seven times further away.

Secondly, the government's decision to halve APD on domestic flights (a measure which came into effect two days after the so-called "Green Day" of 2023 climate policy announcements) and the higher emission factors attributable to domestic flights means that the implicit carbon price of domestic APD is substantially lower than for international flights.

Thirdly, for longer haul flights substantially more space is allocated to business and first class, which has a big impact on the emissions attributable to those passengers. **This leads to the perverse outcome that economy class passengers are paying a higher implicit carbon price, i.e. tax per tonne of greenhouse gas emissions generated, than business class passengers, who are paying a higher implicit carbon price than first class passengers. The private jets continue this trend, with implicit carbon prices well below even those of first class passengers. Under the APD system, the more someone pollutes, the less they pay per tonne of emissions.**

On a London to New York flight, premium economy passengers and private jet passengers **both pay £191 in Air Passenger Duty.**



But the private jet flight produces **nearly 10 times the emissions,** yet is taxed the same.

APD rates compared to flight costs

Private jet flights are significantly more expensive than seats on standard flights, unsurprisingly. This means that, as well as any APD levied failing to reflect the emissions of these flights, it also fails to reflect the much higher price paid to travel by private jet, and APD therefore fails to tax these flights accordingly to ensure that at least the Exchequer sees some benefit.

When we contacted private jet companies while posing as a prospective client, we asked for quotes for a flight between London and Paris. We received back a range of quoted prices, ranging from £4,200 to £47,000.

The highest rate of APD levied on a private jet flight from London to Paris is £78. **This means that APD levied on private jet flights on this illustrative route is between 0.17% and 1.9% of the ticket price - an exceptionally low rate of tax, particularly for a highly expensive luxury service.**

This contrasts with the effective rate of tax as a proportion of ticket price paid by passengers on ordinary flights. A search of the cost of flights from London to Paris on Skyscanner found a range of prices between £30 for an economy seat and £112 for business class.

The APD paid on economy seats to Paris is £13, and for business class £26. This means that tax paid on this route as a proportion of ticket price by passengers on ordinary flights is between 23% (for business class passengers) and 43% (for economy passengers) - orders of magnitude greater than for private jet flights.

Private jet operators' environmental claims

1. Why we investigated private jet companies

Private jet operators are subjected to relatively little scrutiny despite their outsized and increasing emissions. As one private jet broker puts it, "confidentiality is a massive part of what we do."[44] We needed to get behind the curtain to dig into the way these companies work, what they offer their clients, and what they claim to be able to do about their emissions. To explore this world, we had to pretend to be part of it - as a 'mystery shopper' for a private flight.

2. Methodology and findings

We set up a dummy email account for a client services company, posing as a personal assistant to a high net worth individual who was looking into booking a charter private jet but had some concerns about the environmental impact of private jet flights.

We sent 89 private jet operating companies an initial email. From that, 42 provided an initial quote for a private jet flight from London to Paris (or in one case, this was changed to Athens, as the company did not operate to France). Seven companies responded without providing a quote due to company closure, lack of aircraft availability or for some other operational reason. The remainder either did not respond to chasing emails, or we received a bounce back from the initial email.

The 42 companies which provided an initial quote were sent a series of questions about environmental aspects of their operations and then asked to revise the quote with these aspects in mind. Nine companies did not respond, with the remaining 33 companies (less than half of the initial list) providing at least some information.

We found that, while most of the companies offered offsets and some claimed to be able to offer alternative fuels, across the board there was both a lack of understanding about the limits to what these can actually do to address emissions, and misleading claims made about their effectiveness.

Roman Kok, a spokesperson for the European Business Aviation Association, recently said at the European Business Aviation Convention & Exhibition (EBACE): "You do see many more clients nowadays asking their operators, can I get sustainable aviation fuel (SAF), can we offer an offset in [sic] the flight".[45] While we cannot say if Kok's statement is true, we can say from experience that the response from the sector to basic environmental questions is at best inconsistent and sometimes actively incorrect.

On the other hand, there were admissions from some companies about the limits to what can actually be done to address their emissions. This could be read as refreshingly honest, or as an indication of their and their clients' lack of concern about their climate impacts.

The following quotes from responses from private jet companies have been left in their own words and unedited.

We wanted to give private jet flight companies the opportunity to also respond to direct inquiries from Possible as a climate charity, to explain any plans they had to tackle their emissions. So Possible emailed these private jet companies to ask two questions:

1) In November 2019, Possible called for a rapid transition to electric-only private jet flights by 2025. Will your company start using electric planes at any point in the next five to ten years?

2) What is your company's current approach and future plans for addressing the emissions from the flights you sell?

We received no replies at all.

3. Carbon offsetting claims

Of the 33 companies which provided at least some information on the environmental impact of their flights, around half had an offsetting programme, with four others claiming they were in the process of putting a programme in place.

The most commonly cited offsetting programme for private jets was South Pole, which was used by four companies.[46] South Pole's offsetting scheme has been criticised for overestimating the benefits of its projects and claiming up to 30 times more carbon credits than it should have done, along with failing to provide additionality (i.e., not creating any environmental benefits or forest protection that would not have occurred anyway).[47] These serious issues are widespread across companies selling offsets.

One study found that "only 2% of projects have a high probability of resulting in additional emissions reduction",[48] while another found that "at least 52% of approved carbon offsets…[are for] projects that would very likely have been built anyway" and, furthermore, "the sale of these offsets… substantially increased global carbon dioxide emissions".[49]

Other private jet charter companies offered offsets using hydropower stations or cookstoves for communities in developing countries. Dams have been criticised for detrimental impacts on river systems,[50] as well as for their high greenhouse gas emissions,[51] while studies have shown that cookstove projects are over-credited by 6.3 times and do not provide additionality.[52]

Most private jet companies left unsaid the assumption that all emissions from their flights will be offset if customers buy into their schemes, but some make additional claims about their offsets. One company told us that:

"Most [operators] offset 100% of their emissions (and bill you for it), we offset 300% so that all the vehicles involved in delivering catering, baggage etc are taken into account… no one else commits so much investment into offsetting 300% of emissions from tens of thousands of flights per annum."

This gives the inaccurate impression that offsets may allow a private jet flight to reduce emissions by more than it produces, and that taking a private jet flight can be a net positive for the climate.

Offsets were also offered at unrealistically low prices. A video posted on the Air Charter Service website[53] claims that "for 0.5% of the charter price, we believe customers can offset their emissions when they book with us. This is accurate to 98% of historical flights we've looked at." No contextual calculations are provided, but for the quote the company provided (£7,000) this would be a sum of only £35, which under any scenario could not come close to mitigating the flight's emissions.

The UK's Climate Change Committee has been clear about the limits to what can be achieved by offsets, advising companies "to ensure purchase of carbon credits is not used as a substitute for direct business emissions reduction”.[54] Offsets should not be viewed as a viable pathway to tackling the climate impact of emissions from private jets.

4. Alternative fuels claims

Alternative fuels - most commonly called sustainable aviation fuel (SAF) - have been proposed as a solution for aircraft emissions, and we received various statements from private jet companies about the availability, content and effect of SAF for flights.

It is unsurprising that alternative fuels aren’t actually available for the vast majority of private jet flights, as this technology is still at extremely early stages of development and use. The Climate Change Committee’s June 2023 progress report to Parliament notes that although the Government’s Jet Zero Strategy sets a bold target for 10% of UK aviation fuel to be SAFs by 2030, “SAF is a nascent technology and industry. Uptake for 2022 was low at 0.22% of total aviation turbine fuel supply”.[55] This very low base is why the CCC’s own pathways only assume 2% SAF uptake by 2030.

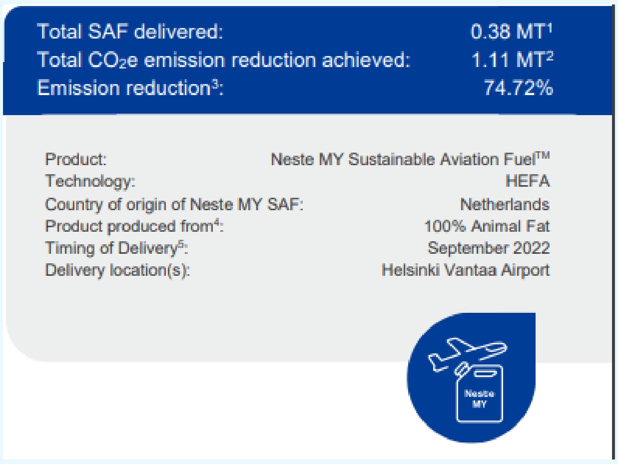
Back in the present, we found that across the private jet sector there was confusion and contradiction about these fuels’ content, effect and availability.

SAF content

There are various different production techniques for SAF, including fuels from waste or biomass, each of which has different potential to reduce emissions.[56] However, one private jet company told us that “there are not different types of SAF. It is just regular SAF”.

Another company said “we offset SAF from renewable raw materials” and another stated that their SAF “makes use of recycled oil etc meaning no fossil fuels”. One operator told us that “Neste SAF is made from 100% renewable waste and residue raw materials”, and then confirmed that the product is in fact produced entirely from animal fat (see Figure 8). The use of animal fat in this way has serious negative implications, which we set out in Appendix 1.

Figure 8. A section of a SAF Delivery Confirmation note sent by a private jet operator, with 100% animal fat given as the product derivation.



Total SAF delivered:	0.38 MT[1]
Total CO_2e emission reduction achieved:	1.11 MT[2]
Emission reduction[3]:	74.72%

Product:	Neste MY Sustainable Aviation Fuel™
Technology:	HEFA
Country of origin of Neste MY SAF:	Netherlands
Product produced from[4]:	100% Animal Fat
Timing of Delivery[5]:	September 2022
Delivery location(s):	Helsinki Vantaa Airport

Effect of SAF on emissions

One operator stated - accurately - that “the carbon emission reduction [from SAFs] is at the point of production of the fuel and not the emissions that are expelled by the jet during the flight”. Nevertheless, other private jet companies made various claims about the emission reductions associated with SAFs.

The UK Department for Transport’s (DfT) own assumptions are that on average SAF provides a 70% reduction compared to fossil kerosene, a figure that has been criticised as over-optimistic and which does not take into account the impact of non-CO_2 emissions from SAF. The DfT implicitly acknowledges that the actual reductions may be more in the region of 40%.[57]

Where an answer was given about the emissions reductions which SAF can provide, every private jet operator provided a higher emissions reduction number than DfT:

- “[SAF] emits a minimum of 75% less emissions compared to fossil jet fuel”
- “Throughout the whole value-chain of using SAF we save 80% of carbon emissions compared to using regular Jet A-1.”
- “Up to 80% compared to conventional jet fuel”, revising this later to “up to 85%”.
- “SAF can reduce total lifecycle CO_2 emissions by over 85% compared to conventional jet fuel.”

- "[SAF] does have the ability to reduce emissions by 70-90% compared to fossil fuels".

These differing figures suggest a lack of understanding and certainty in the private aviation industry about what emissions reductions can be achieved by SAF.

In addition, the private jet operators we heard from consistently confused SAF and offsets. After initially claiming to offer SAF, one operator said: "we are actually still finalising our arrangements to actually offer SAF contributions ourselves. This will be done through our existing carbon offset programme but is not yet currently available." This case also included a claim that all "remaining" emissions from the mix of regular jet fuel and SAF could be offset: "purchasing a carbon credit would be enough to offset the remaining burn [after use of SAF] to get the jet to and from its next jobs".

Another operator said similarly: "if you are at an airport without SAF then our contribution we make to offset 300% of emissions will pay for another Jet which is at an airport that does offer it." Another company recommended a carbon offsetting scheme partially for the reason that they are "more cost effective than SAF".

SAF availability

Private jet operators also provided conflicting statements about the availability of SAF at UK airports.

One company said "Farnborough airport is the only UK airport where it is offered so my suggestion would be to look at flights in and out of Farnborough", while another said SAF is available at six UK airports. Another stated: "SAF fuel is available. The infrastructure needed for its distribution is not as available." This was confirmed to be the case by another company:

> **"To clarify and be transparent on this topic of sustainability, there is no available SAF at that moment due to a lack of infrastructure. This applies for every Airline and plane."**

Another operator openly admitted the reality:

> **"There is not SAF everywhere. And it will be long before it is the case."**

When SAF was claimed to be available, a number of operators provided no quote or only an indicative quote on its cost. As with offsets, SAF was quoted at a wide range of prices and ways of presenting the cost, with no clear or uniform system across the industry. SAF surcharges for a London to Paris flight ranged from £500 to £4,800, demonstrating a large discrepancy in how different companies approach this.

A number of operators acknowledged that only a maximum of 50% SAF is currently allowed for aircraft ("Currently EASA allows a maximum of 50% blend being used in aircraft"), but others stated that 100% SAF use was possible for a flight.

For example, one company said that "we can use 100% SAF on this flight if required" and another said "we could take enough SAF fuel for your trip". Another operator said that "the way SAF works is that you cannot ever guarantee it will be on your flight", which is a more accurate reflection of the way alternative fuels are likely to actually enter the fuel mix.

The proportion of SAF making up the fuel mix was variably quoted:

- "SAF fuel is a mixture of 30% SAF and 70% standard Jet A-1".
- "the max available at the moment is about 35% SAF".
- SAF options of 10%, 35%, 100% and 125% given.
- "100%" SAF fuel, of which 70% is used on a different flight.

One operator told us that "if the client chooses to offset 125% then his [sic] flight is totally carbon neutral".

Another operator was candid about the reality of SAF production and their reasons for not offering it as an option:

> **"We looked into using SAF but there are many schemes and often getting to the bottom of where your fuel comes from and who is benefitting can be tough to work out. Areas where growing food crop is sensible often get used to produce fuel crop and people go hungry. Most of the time when you buy SAF it's not used on your aircraft, it's offset and burned in another one! It's all gets very complicated, so we steered away from that avenue."**

This operator is correct that SAF production is likely to be in direct competition with other more effective ways to reduce emissions across the economy, such as clean energy production, which may make their introduction counterproductive.[58] The feedstocks to produce them also have limited availability.[59]

Saxon Air is one operator that acknowledged the problem:

> **"It is clearly unwise for aviation to rely on future technologies to create a 'just in time' solution to the environmental problems created by the industry's reliance on fossil fuels."**

In all our conversations with private jet companies, it became clear that many companies' sales employees were confused by or unaware of SAFs, and that there was no clear and consistent industry-wide understanding of SAFs, despite some candid statements on their limited efficacy and availability.

There is widespread confusion about what alternative fuels can do, whether (and how) they are available to use and their limitations. This reflects the current extremely nascent stage of SAF production, and the difficulties likely to be experienced in introducing SAF.

5. "Guilt-free" and "carbon-neutral" flying

Some private jet companies actively promote their flights as "guilt-free flying" and "carbon neutral", despite their sky-high emissions.

One operator assured us that "the client does not have to worry about anything whatsoever ever", and another said they don't charge for offsetting "meaning you can fly guilt free". One told us that "our calculations include conservative assumptions, giving you peace of mind and additional reassurance that your total carbon emissions for your flight will be offset".

This collective mindset is demonstrated by Acropolis Aviation, which uses the tagline "Conscience cleared for take off" in their promotions.

Perhaps most notably, one operator even claimed a flight itself could be carbon neutral:

> **"Where the environmental aspect is concerned we have carbon offset links and are working on becoming a carbon neutral company. We may be able to offer a carbon neutral flight for a small fee."**

This is misleading, as there is as yet no such thing as a carbon neutral flight (and certainly not at a low cost).

With awareness of the climate impact of flying rising steadily, and increased public criticism of private jets, the industry appears to be seeking to assuage potential passengers' concerns. However, the claims being made fail to accurately reflect the reality that there is no way to fly on a private jet without harming the climate.

6. Upselling of unnecessarily large aircraft

Some operators offer unnecessarily large aircraft for short flights for a small number of passengers, despite this producing much higher emissions.

While all private jet flights are highly emitting, this seems to be made worse by some operators' suggestion that clients take a much larger plane than is required for the number of passengers flying.

When asking about a private jet flight for four passengers, we were offered aircraft carrying up to 19 passengers, and even huge airliners with capacity to carry more than a hundred people in certain seating configurations. This would result in exceptionally high emissions per passenger, which would not be reflected in the APD charged.

For some of the planes offered, their actual size and capacity is even larger than that suggested by their private jet seating configuration, which has much lower passenger density. The

Airbus 320 Neo, which can be set up as a private jet with 19 seats, can carry between 140 to 170 passengers when set up as an airliner, while the Boeing 737 set up to carry 56 people as a private jet actually has capacity to carry almost three times as many passengers.

Table 9. Outsized aircraft offered when requesting a flight for four passengers.

Private jet operator	Aircraft offered for four passenger journey	Capacity with private jet seating configuration
Acropolis Aviation	Airbus A320 Neo	19
Executive Jet Charter	Gulfstream G450	12
Oryx Jet	Boeing 737	56
Pen-avia	Gulfstream G450	14
PrivateFly	Legacy 650	14
RVL Aviation	Beech King Air 200	15
Voluxis	Global 5000	16

In one instance on Acropolis Aviation's website under the heading "towards sustainable luxury",[60] an attempt was made to claim that the efficiency of the aircraft would be sufficient to reduce emissions, despite it being a 38 metre plane capable of carrying 19 people:

> **"When you charter our new Airbus ACJ320neo, you can take comfort in the fact that you are flying in one of the world's most modern, fuel-efficient aircraft. Its next generation LEAP-1A engines from CFM International and advanced Airbus wing design deliver low emissions."**

7. Regulatory change required if electric aircraft are to be delivered

A wide range of actors in the aviation industry have claimed that electric aircraft could be introduced rapidly. For example, EasyJet claimed in September 2017 that they could be flying electric planes by 2027.[61] As mentioned previously, we contacted private jet companies as Possible to ask if they plan to start using electric planes at any point in the next five to ten years, but received no responses.

Most private jet company websites provide little information on future plans. According to the Air Charter Service website, they "started to invest in electric flight research as far back as 2014... We are now committed to investing into further initiatives and research, with an annual budget of £60,000." This figure is equivalent to only around eight of their short haul flights at the quoted cost.

The lack of response from private jet companies suggests that the private aviation industry has no substantive plan to support delivery of electric aircraft. This is perhaps unsurprising in an industry that faces no regulatory or tax pressures to reduce its emissions or invest in a transition to electric planes. Of the 42 companies which responded to the request for a quote, more than half made no reference to climate, environment or sustainability anywhere on their public-facing websites.

Lyddair's website states:

> **"For those who fly for pleasure the time saving, convenience and VIP nature all exemplify your standing in society and a richly deserved mode of travel."**

Another operator acknowledged that:

> **"At the moment we are working on a new emissions trading campaign but it is not usable for now. Also SAF is not yet provided at most airports. The aviation industry is working with high pressure on a solution to make air traffic environmental friendly! For now, I can't provide you with a satisfying solution for this."**

Ultimately, the unchecked growth of high-emitting private jet flights, and the industry's lack of a plan or even any clear ambition to transition to electric aircraft, results directly from a lack of regulatory pressure. **It is clear that the private jet industry will not clean up its act without regulatory and tax changes.**

Appendix 1: the use of animal fat in alternative aviation fuels

One operative (Fly Victor) responded to our request for details on their sustainability with a document describing their purchase of 380kg of aviation fuel derived from "100% animal fat", which was claimed to reduce emissions by (the very specific amount of) 74.72%.

While the public are urged to consume 20% less animal products to reduce the UK's carbon footprint,[62] elite travellers can apparently burn more of them in private jets to reduce their own climate impact. This may be a counter-intuitive idea, but it is one that the jet fuel provider Neste is substantially invested in, describing animal fat "from food industry waste" as a leading feedstock.[63] Despite describing animal fat as waste, in recent years it has acquired three animal fat trading companies.[64] The UK's Renewable Transport Fuel Obligation guidance says "tallow (rendered animal fat) has a high economic value and a variety of productive uses. It is a direct substitute for other products (for example, palm oil)."[65]

The pre-existing uses include biodiesel,[66] cosmetics, soap, detergents, livestock feed, and pet food. These industries in Europe are concerned that airlines burning through the available animal fat supply[67] will force them to turn to more unsustainable options,[68] such as palm oil.[69] In the case of pet food, whereas fuel can be made from a wide variety of feedstocks, if low-grade food is not available, pet food will have to source ingredients suitable for human consumption, which again will increase the total environmental impacts, as well as the costs to consumers.

Animal products are characterised by high emissions. Almost 26 times as much emissions are created by producing 1 kg of beef,[70] as from burning 1 kg of kerosene. So how can fat from the same animal be made into fuel that has only a quarter of the carbon footprint? The answer is that the aviation industry's methodology assumes that none of the climate damage caused during the animal's life is included in the fuel's impact.[71] However, methodologies may change;[72] a recent survey of lifecycle assessment practitioners found most believed that animal fat should be allocated a share of the environmental impacts.[73] If even 4% of the impacts of beef were allocated to beef fat, its carbon footprint simply as a feedstock would exceed that of fossil jet fuel.

The use of animal fat as SAF feedstock is obviously problematic in a number of other important ways which demand public scrutiny and debate, as many people hold religious beliefs and/or values systems which are not compatible with the consumption of products derived from livestock, regardless of whether this is physically ingested or burned as fuel.

Appendix 2: the problem with carbon offsets

Generally speaking, carbon offsetting as a practice simply does not work, and does more harm than good by justifying high-carbon activities.

In the aviation industry specifically, it has been reported that airlines' carbon emissions rely on 'phantom credits'. British Airways (BA), for example, has previously offered the chance to "fly carbon neutral" by buying credits for protection schemes in threatened forests, but an analysis of schemes backed by BA, easyJet and United Airlines suggests the scale of the carbon benefits they offer is impossible to verify and may be exaggerated.[74]

As Greenpeace highlighted, "Any scheme claiming to be generating carbon savings by protecting a forest has an awful lot to prove. It needs to show that those savings wouldn't happen anyway even if the scheme didn't exist; that deforestation has not simply been pushed over into a nearby area; and that the project will last long enough for the carbon to be reabsorbed."[75]

There is also an over-reliance on nature-based solutions (NbS) in carbon offsetting. One major review of net zero strategies suggests that the first priority for NbS is stabilising the carbon in the biosphere itself, with NbS only subsequently being considered a potential way of compensating for further fossil CO_2 release. Even then the practice is "ultimately pointless" as carbon emissions and removals must balance over multi-decadal timescales.[76]

Endnotes

1. www.wearepossible.org/our-reports-1/missed-target-a-brief-history-of-aviation-climate-targets
2. https://green-alliance.org.uk/wp-content/uploads/2023/06/Taxing-private-jets_Green-Alliance-briefing_June-2023.pdf
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