AIRLINES UK
THE ASSOCIATION OF UK AIRLINES

frontier economics

The Impact Of Air Passenger Duty On Airline Route Economics

A report prepared for Airlines UK

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FOREWORD

UK Air Passenger Duty (APD) is the highest rate of tax on air travel anywhere in the world which impacts all departing passengers from and within the UK and can, on some routes, represent up to 50% of the ticket price. The aviation sector is a vital pillar of the UK economy, with UK airlines generating substantial positive spill-overs for other sectors and the wider economy including an overall contribution to GDP of £10.9 billion, support for around 200,000 jobs and providing for over 45% of the UK's extra-EU trade by value.

Airlines UK has long made the case that abolishing APD would have a transformative effect on the UK's international competitiveness; boosting trade, increasing productivity and encouraging the growth of inbound tourism. Research has shown that reducing or abolishing APD would create tens of thousands of new jobs and, critically for the UK Treasury, the change would pay for itself through growth and by boosting revenues for the Government from other taxes.

This report serves to build upon this earlier work by demonstrating the real-world negative impact of APD on the way airlines choose, develop and maintain routes and, conversely, the advantages to be gained through its abolition. By increasing the price of a ticket by such an extent, the Government is directly contributing to fewer connections at UK airports and lower frequency on existing services. The costs of such a counterproductive policy are clear - with dozens of potential services, including long-haul connections outside of London - remaining unviable, putting a brake on the UK's economic growth and international competitiveness compared to our main European rivals.

Most major economies do not tax air travel, and countries such as Ireland, the Netherlands and Belgium have abolished their equivalent tax after recognising the negative impact it had on their aviation sector and connectivity. Those that do levy an equivalent tax (such as Germany, France, Austria and Italy) have much lower rates.

The UK, therefore, remains at a competitive disadvantage as a result of its policies on taxing air passengers. Today, as an island nation preparing to leave the European Union, it is more important than ever that we seize the opportunity to create the best conditions for economic success. It is increasingly untenable - at a time when the UK is looking to strike deals and open ourselves up to new markets and opportunities around the world - to continue to levy such excessively high levels of taxation on air travel.

Airlines are, ultimately, in the business of responding to demand. By getting rid of this damaging tax once and for all carriers will respond in kind with more routes, greater frequency and better connectivity for the whole of the UK. There is not a moment to lose.

Tim Alderslade
Chief Executive of Airlines UK

At the heart of the Government's emerging strategy for UK aviation - a vision of what the sector could be by 2050 - is the aim of building a truly global and connected Britain.

This is a laudable aim, all the more important as we leave the European Union and look to our country's world class aviation sector to help the UK reach out to new markets and opportunities. However, it is apparent from this new report that, unless there is a step change in policy towards Air Passenger Duty, the sector is going to be facing this challenge with one hand tied behind its back.

This report shows the 'real-world' impact of the UK's sky high APD rates on airline decision making and the ability of carriers to introduce and grow important air links – from and between all corners of the UK. It shows that we are losing out on over 60 potential connections because of the way the tax increases ticket prices for leisure and business travellers, making routes for which there is demand simply unaffordable to maintain. New connections bring opportunities for tourism, trade and cultural exchange, as well as much needed investment in regional economies, as we have seen in my own area with the transformational impact of the new direct Manchester-Beijing route, which has driven a huge increase in exports and inward investment since launching.

We have recently made great strides towards delivering a third runway at Heathrow Airport, and Ministers deserve great credit for this. The Treasury should now look to build upon this momentum by looking again at the damaging impact of APD on the whole of the aviation sector. Our economic competitors around the world are wasting no time cutting or abolishing their equivalent air travel taxes to boost their own competitiveness, and this report shows why it is high-time – with Brexit approaching – that we grasped the nettle and did the same.

Sir Graham Brady
Member of Parliament for Altrincham and Sale West

EXECUTIVE SUMMARY

Frontier Economics has been commissioned by Airlines UK to describe how APD impacts on airline route economics. We summarise our findings below.

Air Passenger Duty (APD) was first introduced in the UK in 1994, charging passengers £5 to fly to destinations within the European Economic Area (EEA) and £10 to fly to all other destinations. It was initially designed to raise around £330 million per year.

Since then, the tax has been restructured and the rates have increased, with APD raising over £3.4 billion last year. This equates to an average growth rate of around 10% per annum, outstripping the UK's average GDP growth of around 2% per annum over the same period.

Airlines UK has long campaigned for the abolition of APD. Because APD increases the price of tickets for passengers, it dampens demand and impacts negatively on connectivity at UK airports. Airlines UK has previously commissioned research illustrating the significant economic benefits that could result from an abolition of APD.

Our report builds upon this research, and describes how APD impacts on airline route economics.

In Section 1, we set out the scope of this report, and describe how APD rates vary by class of ticket. We highlight existing analyses of the impact of the tax, all of which show its negative impact on demand. In Section 2, we present introductory analysis to estimate what APD represents as a proportion of total ticket prices. We find that:

- APD represents on average around 16% of ticket prices for passengers flying to short-haul destinations, and 18% for long-haul destinations. This rises to 27% and 26% respectively during off-peak periods. We note that these figures are averages, meaning that for some passengers, including those who book in advance and pay lower-than-average prices, APD will be an even higher proportion of the total.
- By raising around £3.4 billion per year, APD is broadly comparable in size to departing airport charges at the 10 largest airports in the UK (For long-haul, APD is significantly higher than airport charges).

In Section 3, we describe how the removal of APD would impact on route viability, applying insights from traditional microeconomic models as well as a more airline-specific model of competition. We find that the removal of APD would boost the UK's air connectivity leading to:

- brand new connections being added; and
- frequencies on existing routes being increased.

In Section 4, we consider how APD impacts on marginal routes:

- Short-haul: if an airline were to operate a new short-haul connection with an average load of 100 passengers, it would need to generate at least £1,300 per flight just to cover APD, or nearly £500,000 per annum for a daily connection. For domestic connections, where APD is levied on both the outbound and inbound legs, this rises to around £1 million per annum.

- Long-haul: if an airline were to operate a new long-haul connection with an average load of 200 passengers, it would need to generate at least £15,600 per flight just to cover APD, or nearly £6 million per annum for a daily connection. This is particularly significant in the context of the advent of low-cost long-haul travel.

Or in other words, if APD were abolished, the viability threshold for adding new connections would be lower. We have also carried out analysis on marginal routes:

- Analysis of dropped routes: members of Airlines UK have provided us with cost, revenue and demand data on actual routes which they have dropped in recent years on the grounds that they were loss-making. We have carried out ex-post APD scenario analysis to consider what the impact of lower APD might have been on ticket prices, demand, and the overall profitability of the routes and whether this might have been enough to make them viable. Of the routes provided to us, we find that all of them could have been viable if APD had been abolished.
- Benchmarking: we have carried out some high level benchmarking analysis to identify potential new connections which would receive a viability boost if APD were to be abolished. We identified over 65 potential new connections. We note that abolishing APD would not necessarily automatically lead to these routes being added. Instead, this is designed to give a flavour of the sorts of routes which could potentially be added.

We provide our overall conclusions in Section 5.

1 INTRODUCTION

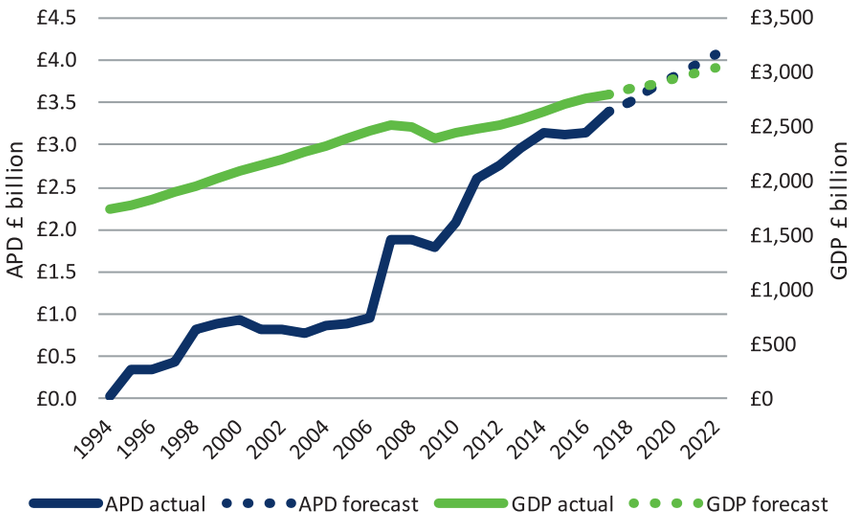
1.1 Background

Air Passenger Duty (APD) was first introduced in the UK in 1994, and was split into two bands:

- The lower rate charged passengers £5 to fly from UK airports to airports within the EEA; and
- The higher rate charged passengers £10 to fly from UK airports to all other destinations.

It was initially designed to raise around £330 million per year. Since then, the charge has been restructured and the rates have increased, with APD raising around £3.4 billion last year. This equates to an average growth rate of around 10% per annum, outstripping the UK's average GDP growth of around 2% per annum over the same period. It is forecast to raise over £4 billion by 2022-23.

Figure 1: Air Passenger Duty raised over £3.4 billion in 2017



Source: Frontier analysis based on data on APD from the ONS (actual) and OBR (forecast), and GDP from the World Bank (actual) and IMF (forecast)

The table below shows the current APD rates as of April 2018.

Figure 2: APD rates from 1 April 2018

	Reduced rate	Standard rate	Higher rate
Band A	£13	£26	£78
Band B	£78	£156	£468

Source: https://www.gov.uk/guidance/rates-and-allowances-for-air-passenger-duty

Notes: Various terms, conditions and exemptions apply. The 'higher' rate broadly corresponds to private jets. The 'reduced' rate broadly corresponds to passengers flying in economy class, and the 'standard' rate is for non-economy class passengers (premium economy, business and first class). Band A relates to short-haul destinations and Band B relates to long-haul. Long-haul is defined as any country where the capital city is greater than 2,000 miles from London.

By way of illustration:

- a passenger flying from the UK to the USA (Band B) would pay £78 in APD in economy class, and £156 in APD in all other classes (premium economy, business and first class);
- a passenger flying from the UK to Spain (Band A) would pay £13 in APD in economy class, and £26 in other classes; and
- a passenger flying from the UK to another destination in the UK (Band A) would also pay £13 in APD in economy class, and £26 in other classes. However, we note that in the case of domestic flights, passengers making a return trip pay APD on both legs, whereas for international flights, APD is levied on flights departing the UK only.

Because APD increases the price of tickets for passengers, it dampens demand and impacts negatively on the viability of routes, and as a result, it impacts negatively on connectivity at UK airports, resulting in:

- fewer connections: Some routes may not be viable because of APD, and are therefore not operated by airlines; and
- lower frequency: Even on routes which are currently operated, APD dampens demand such that frequency is lower than it might otherwise be without APD. And on some routes, this may result in airlines only operating the route during peak seasons.

Moreover, given that air travel is an essential input to many businesses, and enables people and goods to move quickly around the world, APD increases the cost of doing business and stifles the UK economy. For example, a 2007 study by IATA found that a 10% increase in connectivity, relative to a country's GDP, boosts labour productivity by 0.07%.[1] And with respect to tourism and leisure, APD could be enough to price more price-sensitive holidaymakers out of travelling to and from the UK.[2]

Airlines UK has long campaigned against APD and has commissioned various reports to support its position:

- The Economic Impact of Air Passenger Duty (PWC 2015)[3]: this report estimated that abolishing APD could boost economic growth, create up to 61,000 jobs, and ultimately pay for itself through higher revenues from other taxes. It found that the tax currently suppresses demand for flights by 10%.
- Flying High? How Competitive is Air Passenger Duty (Steer Davies Gleave 2016): This report found that APD in the UK is the highest aviation tax of its kind in Europe for both short-haul and long-haul, and the highest tax in the world for long-haul.
- Freedom to Grow (Airlines UK 2017): This report examined the impact on demand after comparable aviation taxes in other countries were abolished. For example, it found that following reductions in aviation taxes in Ireland demand increased by around 12.5%.
- Reaching Out to The World – How Scotland's Aviation Connectivity Compares (RDC 2017): This report compared taxes and connectivity in Scotland with those in 10 similar-sized countries in Europe. It found that Scotland had the highest taxes and was second bottom in terms of connectivity.

1 IATA Economics Briefing No 8: Aviation Economic Benefits 2007

2 Especially when combined with other costs such as Visas and/or hotel costs.

3 Airlines UK did not commission the original PWC study, but did commission its update in 2015.

In addition to the above, a recent report by Steer Davies Gleave (2017) highlighted the benefits that new connections can bring to the UK regions.[4] It evaluated the impact that the launch of a new direct connection between Manchester and Beijing – the first ever direct connection from the UK to mainland China outside of London – had on the Manchester economy and the surrounding regions. It found that:

- exports from across the north of England from Manchester airport to China nearly trebled to around £200m a month in the year after the launch of the new route; and
- spending in the region from visitors from China doubled to nearly £140m a year in the year after the launch.

Therefore, by dampening demand and reducing the viability of potential new connections, APD could well be responsible for UK regions missing out on opportunities of this kind.

1.2 The scope of this report

Frontier Economics has been commissioned by Airlines UK to describe in more detail how APD actually impacts on airline route economics and viability.

The rest of this report is structured as follows:

- **Section 2: APD as a proportion of ticket prices.** In this section we provide some introductory analysis to estimate what APD represents as a proportion of total ticket prices, for a selection of destination countries;
- **Section 3: How APD impacts on airline route economics.** In this section we describe how APD impacts on airline route economics, including what we would expect to happen following the abolition of APD;
- **Section 4: The impact of APD on marginal routes with relatively low demand.** We have carried out two pieces of analysis:
  - Dropped routes: Members of Airlines UK have provided us (on a strictly confidential basis) with cost, revenue and demand data on actual routes which they have dropped in recent years because they were loss-making. We have carried out ex-post APD scenario analysis to consider what the impact of abolishing APD might have been on ticket prices, demand, and the overall profitability of the routes;
  - New connections: We have also carried out some high level benchmarking analysis to identify potential new connections which could receive a viability boost if APD were to be abolished.
- **Section 5: Conclusion.** In this section we provide our overall conclusions.

4 Steer Davies Gleave: The China dividend one year in (2017).

2 APD AS A PROPORTION OF TICKET PRICES

2.1 Introduction

In this section we provide some introductory analysis to estimate what APD represents as a proportion of total ticket prices, for a selection of destination countries. This is to give a sense of the proportionality of APD relative to ticket fares. To put our results into perspective we have also compared APD to the departing passenger charge (DPC) component of airport charges.

2.2 Approach

Our approach is as follows:

- Destination countries considered: We have taken the top 10 most popular short-haul destination countries and the top 10 most popular long-haul destination countries for point-to-point passengers across all UK airports. This is based on passenger volumes for 2017, based on data from OAG Traffic Analyser.
- Ticket prices: We have used estimates of ticket prices from OAG Traffic Analyser.[5] For simplicity, we have considered point-to-point passengers only, and have reported the prices on an outbound basis departing the UK and not on the basis of a return trip.
- APD: We have applied the 'reduced' rates (which broadly correspond to passengers flying in economy class) of £13 per passenger for short-haul destinations and £78 per passenger for long-haul destinations.
- Time period: We have reported average ticket prices for two periods:
  - Full year 2017 – This is the average ticket price for a point-to-point flight across all UK airports to the destination country across the whole calendar year; and
  - 'Off-peak' – For each destination country we have analysed how the average ticket price varied in each month in 2017. We have then selected the month with the lowest average ticket fare for each destination country. This is to highlight that during quieter periods when airlines need to lower their ticket prices to try to stimulate extra demand, APD represents a higher share of ticket prices.

2.3 Results

Our results are split out into three parts:

- Short-haul;
- Long-haul; and
- APD versus DPCs: To put our results into perspective we have also compared APD to the departing passenger charge (DPC) component of airport charges.

5 We have used its 'online fares' estimate which, unlike previous estimates, now includes airport charges and also includes fares for LCCs. The estimates do not include taxes (i.e. APD) which we have then added on.

These are described in turn below.

2.3.1 Short-haul

The table below summarises our results for short-haul destinations. This covers the top 10 most popular short-haul destination countries at all UK airports in 2017.

It shows that in 2017 the average price paid by passengers to fly point-to-point from the UK to Spain (the most popular destination country) was £91, of which APD (assumed at the 'reduced' rate of £13) represented 14%. Ticket prices to Spain in 2017 were lowest in January, at £46 on average, meaning that APD represented 28% of the total.

We note that these figures are averages, meaning that for some passengers, including those who book in advance and pay lower-than-average prices, APD will be an even higher proportion of the total.

Figure 3 APD as a proportion of average ticket price – short-haul

		Average ticket price (annual)	of which APD	Average ticket price (off-peak)	of which APD
1	Spain	£91	14%	£46	28%
2	United Kingdom	£61	21%	£50	26%
3	Italy	£86	15%	£45	29%
4	Germany	£69	19%	£49	27%
5	France	£72	18%	£49	27%
6	Ireland	£47	28%	£30	43%
7	Poland	£60	22%	£26	50%
8	Netherlands	£69	19%	£60	22%
9	Portugal	£94	14%	£46	28%
10	Switzerland	£87	15%	£70	19%
	Average – short-haul	£79	16%	£47	27%

Source: Frontier analysis based on OAG data

Across the sample, APD therefore represents around 16% of ticket prices for short-haul passengers, rising to 27% during off-peak periods.

The off-peak results for Poland show that the average ticket price during the quietest month – which was January for Poland – was just £26 meaning that APD represented half of the ticket price. This highlights the challenge that airlines face as they try to stimulate demand during quieter periods.

2.3.2 Long-haul

The table below repeats the analysis for the top 10 long-haul destination countries for UK passengers.

Figure 4 APD as a proportion of average ticket price – long-haul

		Average ticket price (annual)	of which APD	Average ticket price (off-peak)	of which APD
1	USA	£447	17%	£322	24%
2	United Arab Emirates	£326	24%	£227	34%
3	Canada	£555	14%	£360	22%
4	India	£396	20%	£299	26%
5	Israel	£268	29%	£178	44%
6	Hong Kong China	£515	15%	£287	27%
7	China	£528	15%	£310	25%
8	Mexico	£554	14%	£326	24%
9	Saudi Arabia	£377	21%	£303	26%
10	Singapore	£476	16%	£300	26%
	Average – long-haul	£422	18%	£302	26%

Source: Frontier analysis based on OAG data

The reduced rate for Band B destinations is £78 per passenger. This implies that APD represents around 18% of ticket prices to long-haul destinations on average, rising to 26% during off-peak periods.

The results are most pronounced for Israel. APD represents around 29% of prices to Israel on average, rising to 44% during off-peak periods.

Again, we note that these figures are averages, and many passengers will pay below the average. Also, the advent of low-cost long-haul business models is resulting in lower ticket prices to many long-haul destinations. On these routes, where ticket prices are lower, APD represents a much higher share of the total.

2.3.3 APD versus DPCs

To add perspective to these figures, we have sought to compare the size of APD to the size of departing passenger charges (DPCs). DPCs are charges that airports levy to airlines to recover the cost of providing the airport infrastructure and terminal services. The DPC is only a partial picture of total airport charges as airlines also have to pay other charges, such as landing charges. However, DPCs do tend to represent the largest proportion of airport charges.[6] Or, in other words, DPCs can be considered the main airport charge.

APD and DPCs are comparable in nature to the extent that they are both levied / charged on a 'per passenger' basis and therefore impact ticket prices in a similar way. Of the total price paid by a passenger to fly, a component is APD, which is paid to the Government, another component is the DPC,

6 By way of illustration, DPCs at Heathrow are designed to recover 67% of total aeronautical revenue. https://www.heathrow.com/file_source/Company/Static/PDF/Partnersandsuppliers/Heathrow-Airport-Limited-Airport-Charges-Decision-2018.pdf

which is paid to the airport, and the rest is revenue from which the airline must recover all other costs (including ATM-related charges).

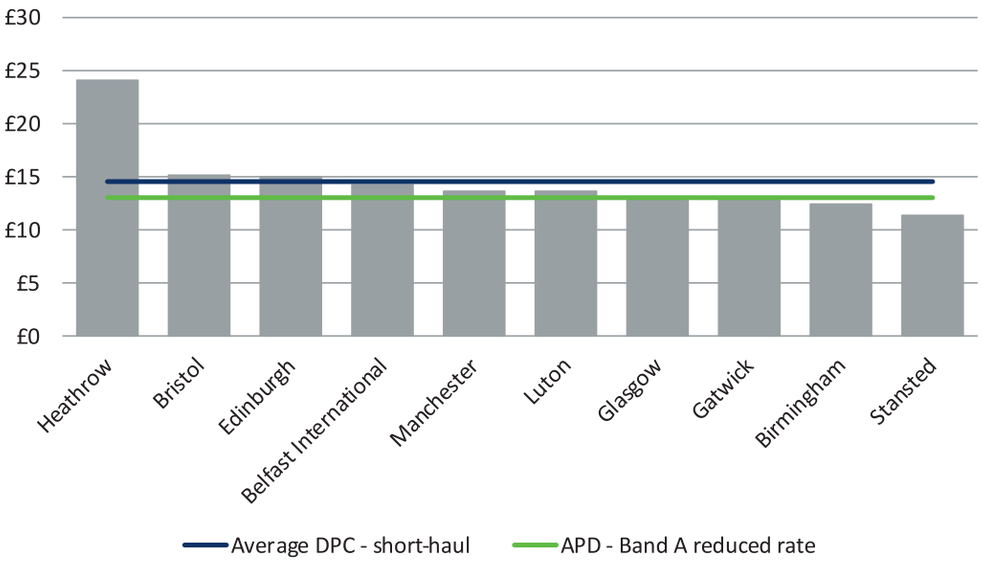
As described below in more detail, we find that APD and DPCs are also broadly similar in size. This means that the total amount generated by APD is about the same order of magnitude as the total DPCs paid by airlines, which in turn accounts for a significant proportion of the total aeronautical revenue generated by all UK airports.

To compare APD (which is split out by Band A and Band B) to DPCs, we have considered the DPCs which would apply to Band A and Band B destinations separately.

Short-haul / Band A

In the chart below we report the DPCs which would be applied for passengers departing to EU destinations at the top 10 largest airports in the UK by passenger volumes. These airports collectively account for about 85% of total passengers in the UK.[7]

Figure 5 Departing passenger charges at the Top 10 UK airports by passenger volumes – EU destinations



Source: Frontier analysis based on various publicly available Conditions of Use documents

The analysis shows that the average DPC in the sample is around £15 per passenger, compared to the 'reduced' APD rate of £13. In other words, DPCs and APD are broadly similar in size.

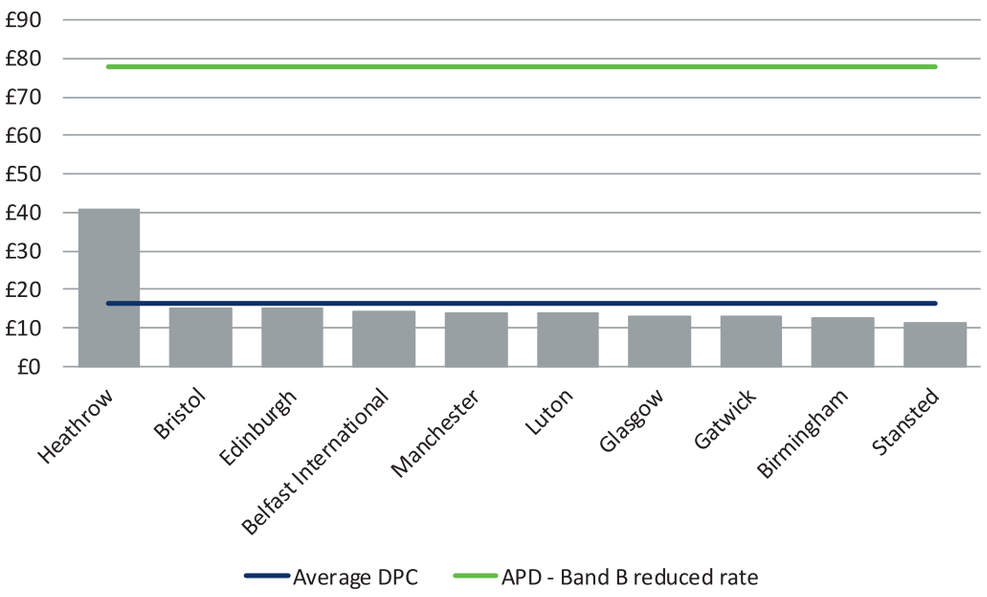
By way of illustration, this suggests that for a £50 ticket to depart the UK to a short-haul destination, £13 (or 26%) relates to APD, £15 (or 30%) is paid to the airport, and the remaining £22 (44%) is revenue for the airline, from which it must recover direct operating costs – including fuel, air navigation charges, crew costs and other airport charges such as ground handling – and contributions to fixed costs, including aircraft and head office costs.

7 We have sourced the DPCs from publicly available Conditions of Use documents which appear on the airports' websites. We note that in reality at some airports airlines may be able to negotiate discounts, which we cannot observe.

Long-haul / Band B

The chart below repeats the analysis for long-haul.

Figure 6 Departing passenger charges at the Top 10 UK airports by passenger volumes – long-haul destinations



Source: Frontier analysis based on various publicly available Conditions of Use documents

Heathrow is the UK's main gateway for long-haul connectivity, with over 60% of all long-haul departures leaving from there. The results show that for long-haul, DPCs are dwarfed by the reduced rate of Band B APD at £78.

By way of illustration, this suggests that for a £300 ticket to fly from the UK to the USA, £78 (or 26%) relates to APD, and up to £41 (or 14%) relates to airport charges, with the rest being revenue for the airline.

3 HOW APD IMPACTS ON AIRLINE ROUTE ECONOMICS

3.1 Introduction

In this section we describe how APD impacts on airline route economics, including what we would expect to happen following the abolition of APD. We have approached the question in two ways:

- Applying insights from the more traditional microeconomic models of perfect competition and monopoly competition; and
- Applying insights from a more airline-specific model of competition. These points are described in turn below.

3.2 Insights from traditional microeconomic models of competition

Under the textbook model of perfect competition, firms set prices at marginal cost. This implies that a change in marginal cost (APD is a marginal cost) would lead to an equal change in ticket prices. Under this simplistic model a reduction in APD would lead to an equal reduction in ticket prices, an increase in the demand to travel and an increase in consumer surplus. But because of the assumption of perfect competition, airline profits would remain constant[8].

But this simple model is not very helpful in thinking how airline route economics work in practice. Under "perfect" competition markets are served by many firms, each small with respect to the size of the overall market. Supply is also assumed to be continuous, that is any market, however small in size, can be served provided the customers' willingness to pay is greater than the marginal cost of supplying them.

But airline markets, viewed as point to point routes, clearly do not look like this. The number of firms (airlines) on any route is usually relatively small, and for the thinnest routes with the lowest levels of demand there is often only one carrier.

Furthermore, supply is not perfectly continuous. Airline cost structures are such that costs are fixed over a variety of time frames. For instance, the airline incurs a fixed cost for the finance of the aircraft, regardless of whether it uses it on any given flight. And while the aircraft may be flexible between routes, and relatively freely tradeable, the airline will also have fixed costs associated with the operation of a base and centralised costs of route planning, management, etc, which are flexible again over a longer time frame. Furthermore, for regular scheduled services there are effectively minimum schedule frequencies, while aircraft sizes are not infinitely flexible, even when airlines operate a mixed fleet. This creates "lumpiness" or indivisibilities in the capacity airlines can deploy in reality.

All this means that, if demand falls, or costs (including APD) rise sufficiently, there are routes that are simply not served at all.

While we stress that all theoretical models are inevitably a simplification for the purpose of producing important insights, and no one model completely describes how airline markets work, it is possible to draw further insights from models of "imperfect" or differentiated competition, which go some way to explain the way airline markets work in practice.

8 Economists refer to the level of economic profits in this case as zero, meaning the normal competitive level, which for simplicity can be taken to mean the level that covers all costs including a market return on any capital employed.

3.3 Insight from a more airline-specific model of competition

The key features of the way airline route economics work and why APD affects route viability are as follows:

- Airlines' key decision variable is capacity, not ticket prices. Airlines tend to commit capacity (aircraft, frequencies and seats flown) to a given route some time in advance. Typically schedules are set in two seasons per year and airlines set their schedules one or two seasons in advance, to allow for fleet planning and the sale of tickets.
- Each airline makes its own decision on the capacity to deploy on a route, bearing in mind its own view of the demand on that route and also, to an extent, what it believes rival airlines will do.
- Ticket prices are then set so as to maximise profits on flights to which the airline has committed. This means ticket prices are not directly set by the airline but are the outcome of capacity decisions they and their rivals have previously made.
- These prices (the amount the passenger actually pays) need to cover all the airlines costs in the long run, including its own direct costs, airport charges (both passenger-related and ATM-related charges) and taxes such as APD.
- Nobody has perfect foresight, and in any given scheduling period prices may result in airlines making losses or profits, depending on the actual demand to travel and the capacity choices of all the participants (airlines).
- If the carriers on a route have undersupplied capacity, ticket prices will tend to rise in the short run and airlines will tend to commit more capacity in future. If they do not do this it is very likely that another carrier will choose to enter the route in response to observed high prices. On the other hand, if the participating airlines are making losses, they will review their capacity commitments and may reduce their service to re-establish a profitable service. But if conditions are poor enough, some or all carriers may withdraw from the route altogether if they do not believe it can be profitable.
- This dynamic pattern of capacity adjustment, backed by route entry and exit is how competition works in reality in the airline industry. The likely outcome is that over the long run ticket prices will move in line with changes in costs, but in the short to medium term prices on individual routes may not fully and immediately vary in line with costs leading to impacts on individual route viability.

This pattern of competition as described above most closely resembles the theoretical model known as competition, which is a differentiated form of competition fought out by competitors that first and foremost choose the capacity they offer and then market prices result from that.

However, this model, in its simplest form is unsatisfactory to describe real airline markets because the simple Cournot model takes the number of participants in a market as a given, whereas as we have described above, the reality of airline markets is that the number of participants itself will be a dynamic factor.

Cournot-like models with completely free entry can be shown to result in "normal" economic profits in all markets by making the number of participants completely dynamic.

While this is a useful and relevant paradigm it also probably does not completely describe airline route economics because while entry and exit is relatively easy, in most cases it is not completely costless. Route entry and exit may seem relatively straightforward, but there are nevertheless some transition costs in establishing or cancelling a route, especially if done rapidly. These include the fact that routes must be advertised and sold in advance, which limits the speed of entry, while cancelling services may involve airlines in costs to deal with passengers already booked, as well as potential reputational effects.

The simple Cournot model would suggest that ticket prices on any given route would be negatively correlated with the number of carriers on that route and pass through of changes in costs such as APD may be partial. The more carriers there are on a route, the more prices would reflect the competitive outcome. With completely free exit and entry prices no longer reflect the number of carriers and full cost pass through of changes in costs such as APD appears to occur.[9]

That exit and entry is not completely free is likely to mean the reality lies somewhere between these two extremes. Add to this the previously mentioned "lumpiness" of capacity and the fact that the number of carriers obviously has to be a whole number, not a continuous variable, and we conclude that for dense popular routes the outcome is likely to be close to one of full cost pass through while for thinner routes cost pass through may be less perfect.

The most marginal routes will typically only be able to sustain one carrier. Prices will be raised as a result, but this is a necessary condition to allow the coverage of fixed costs that are high compared to the relatively low demand. In these circumstances APD may have a significant impact on route viability because the incumbent carrier is not able to recover APD in full through ticket prices[10].

9 For the avoidance of doubt, however, prices in this model do not equate to marginal costs. Entry and exit occurs to "normalise" economic profits, allowing for the recovery of fixed costs as well.

10 As an aside, it should not be assumed that on thin routes (viewed as an airport to airport pair) with one carrier we observe excessive prices. Prices may indeed be somewhat higher than on more popular routes because of the impact of high fixed costs, relative to the low level of demand, but they are still constrained by numerous factors including a remaining threat of entry, flights from alternative airports in the same location and competition from other modes of transport.

3.3.1 Possible market outcomes following the abolition of APD

The models of competition described above provide a helpful framework for assessing what might occur – to ticket prices, demand, airline profits, and route viability – following the abolition of APD.

To recap, the models of airline competition discussed above suggest two main outcomes, depending on the popularity of the route.

- **An increase in the viability of marginal routes.** On these routes the abolition of APD may be shared to some extent between the airline and passengers. In this case, the primary benefit for customers is connectivity: a new route added, or a marginal route being maintained. Abolishing APD could be sufficient to tilt the balance of a marginal route from non-viable to viable. This is more likely in cases where APD is a significant proportion of ticket prices, as the impact of getting rid of APD will be proportionally larger.
- **A decrease in ticket prices on routes with higher demand.** For these routes, competition would push airlines to fully pass through the abolition of APD, so ticket fares would reduce and demand increase, with capacity (either larger aircraft with more seats or extra frequencies) rising to meet the extra demand. In this scenario, the APD abolition would benefit customers through an increase in consumer surplus (equal to the reduction in APD) and an increase in frequency.

4 POTENTIAL NEW CONNECTIONS

4.1 Introduction

In this section we consider how the abolition of APD could lead to new connections at UK airports. We have approached this question in two ways:

- Analysis of dropped routes: members of Airlines UK have provided us with cost, revenue and demand data on actual routes which they have dropped in recent years because they were loss-making. We have carried out ex-post APD scenario analysis to consider what the impact of zero APD might have been on ticket prices, demand, and the overall profitability of the routes and whether this might have been enough to make them viable. Due to commercial confidentiality reasons we are not able to refer to any of the routes in detail.
- Benchmarking: we have carried out some high level benchmarking analysis to identify potential new connections which could receive a viability boost if APD were to be abolished. We note that abolishing APD would not necessarily automatically lead to these routes being added. Instead, this is designed to give a flavour of the sorts of routes which could potentially be added.

The two approaches are complementary in that dropped routes and potential new connections are both examples of routes with marginal viability and therefore where APD can have a large impact on the overall viability of the route. We describe these points in turn.

4.2 Dropped routes

4.2.1 Approach

For each of the dropped routes, we have modelled a scenario where APD is abolished in full. We have then modelled two cost pass through scenarios. However, we note that in reality the actual level of cost pass through would likely lie somewhere in between these two extremes:

- 0% cost pass through: dropped routes tend to be loss making because demand is low. If demand is low, we would expect there to usually be only one operator on the route. For simplicity, and to illustrate the full range of possibilities, under this scenario we assume cost pass through of 0%. Under this scenario we assume no change in prices (and therefore no change in demand) and an increase in airline profitability equal to the reduction in APD. We have then assessed whether this is enough to make the route profitable.
- 100% cost pass through: for this scenario, we assume that ticket prices fall equal to the reduction in APD. As a first-order effect, this results in a change in price which we have then multiplied by a price elasticity of demand (PED) of - 0.7[11] to estimate the expected change in demand. We have then accounted for second-order effects to determine the new market outcome:

11 This is based on a literature review of price elasticities of demand. https://www.iata.org/whatwedo/Documents/economics/Intervistas_Elasticity_Study_2007.pdf

- Load factors: We can observe the average load factor on the dropped routes. If the increase in demand results in a load factor greater than 100% we then increase the ticket prices to the point that demand no longer exceeds capacity. (Therefore, we note that the "100% cost pass through" scenario could result in less than 100% cost pass through).
- Cost variability: If loads change, passenger-driven costs will increase accordingly while fixed costs such as landing charges will remain unchanged. For example, if more passengers are carried, airlines will need to pay DPCs for a greater number of passengers. We have therefore estimated how costs would change following the change in demand;
- Revenue: Following the second-order effects, we have then estimated the new revenue figure which we then compare with the new cost figure to determine the viability of the route.

4.2.2 Results

Members of Airlines UK provided us with data on eight recently dropped routes, all of which were considered not viable. The table below provides our results.

Figure 7 Dropped routes might have been viable if APD had been abolished

	Number of routes which could have been viable
0% cost pass through scenario	4-8 out of 8 routes considered
100% cost pass through scenario	3-7 out of 8 routes considered

Source: Frontier analysis

The results suggest that under the 0% cost pass through scenario 4-8 of the 8 routes could have been viable if APD had been abolished. The range in our results relates to the time horizon considered:

- The higher number assumes that the route must make a cash contribution to the business – i.e. that the revenue generated is greater than the direct cost of operating the route, including fuel, airport charges, crew costs, etc.; and
- The lower number assumes that in addition to the above the routes must also cover all contribution-type costs (e.g. head office costs and aircraft costs).

Even if passengers do not benefit from the APD abolition in terms of paying lower ticket fares (the 0% cost pass through scenario), they would still have benefited in that all of the routes would have been profitable. This might have made the difference between the airline deciding to drop the route or to continue operating it. And clearly, had the connection been continued, this would have benefitted passengers wishing to fly on the route, in addition to boosting the connectivity and economy of the regions concerned.

Under the 100% cost pass through scenario, 3-7 of the 8 routes would have been viable – i.e. fewer than the scenario above. This highlights that while cost pass through benefits passengers in the form of lower ticket prices and increased consumer surplus, if the airline does not make a profit on the route it will not be operated. And as a result, in these instances, a lack of cost pass through is not necessarily a negative market outcome.

To illustrate the impact of APD on the viability of a route:

- Short-haul: If an airline were to operate a new short-haul connection with an average load of 100 passengers, it would need to generate at least £1,300 per flight just to cover APD, or nearly £500,000 per annum for a daily connection. For domestic connections, where APD is levied on both the outbound and inbound legs, this rises to around £1 million per annum.
- Long-haul: If an airline were to operate a new long-haul connection with an average load of 200 passengers, it would need to generate at least £15,600 per flight just to cover APD, or nearly £6 million per annum for a daily connection. This is particularly significant in the context of the rise in low-cost long-haul travel.

Abolishing APD could therefore have a significant impact on the viability of many potential new connections where the figures above could make the difference between the flight being operated or not.

Members of Airlines UK also commented that APD makes airlines more risk averse. Rather than risk adding a brand new connection – where demand is uncertain – they may be more inclined to add an extra frequency on an existing route with more proven demand. Therefore by dampening already uncertain levels of demand, APD may exacerbate this issue further.

4.3 Benchmarking to identify new connections

4.3.1 Approach

We have analysed 2017 schedules data at the 20 largest airports in the UK, by movements. This is based on data from OAG Schedules Analyser. We have identified potential new connections which satisfy the following criteria:

- The destination is currently not served at the candidate UK airport in question (or any other airport in the same city in the case of London and Belfast);
- The destination is currently served by other airports in the UK; and
- The candidate UK airport in question is larger than at least one of the UK airports which already have the connection. We measure size (demand) in terms of the total number of movements at the airport.

Or in other words, if a smaller airport already has the connection, then perhaps a larger airport can too. We note that this analysis is high level. We do not control for other factors which also impact on demand. However, as shown below, it does produce a list of connections which appears plausible. We also note that it is just one approach to identifying potential new connections. If a potential new connection does not appear on our list this does not mean that it would not be viable, but rather that it did not meet the precise criteria defined above.

We report our results in three groups:

- Domestic connections[12];
- Short-haul connections (excluding the UK); and
- Long-haul connections.

These are described in turn below.

4.3.2 Results

We have identified the following number of connections which satisfy the criteria above.

Figure 8 Potential new connections

	Potential new routes
Domestic	20
Short-haul (excluding the UK)	31
Long-haul	15
Total	**66**

Source: Frontier analysis based on OAG data

Please see Annex 1 for a full list of the new connections.

Domestic connections

The illustration below summarises our results. The potential new connections (i.e. those which satisfy our precise selection criteria described above) include:

- Liverpool to Southampton;
- Bristol to Leeds; and
- Edinburgh to Guernsey.

In the particular case of domestic connections, we note again that APD is levied twice – i.e. on both the outbound flight and the inbound flight. This means that for a passenger flying on a return journey in economy class, APD would represent £26 of the ticket price.

12 For domestic and short-haul routes we also apply a minimum (straight line) distance threshold of 150 miles. As a reference, Heathrow to Manchester is 151 miles (straight line) and there were nearly 3,000 departures from Heathrow to Manchester in 2017 – equal to around 7-8 departures per day.

Figure 9 Potential new domestic connections

Source: Frontier analysis using OAG data, and Great Circle Mapper.

Figure 10 Potential new short-haul connections (excluding the UK)

Source: Frontier analysis using OAG data, and Great Circle Mapper.

Short-haul connections (excluding the UK)

The illustration below summarises our results. The potential new connections include:

- Belfast to Madrid;
- Newcastle to Lisbon; and
- Aberdeen to Munich.

Figure 11 Potential new long-haul connections

Source: Frontier analysis using OAG data, and Great Circle Mapper.

Long-haul connections

The illustration below summarises our results. The potential new connections include:

- Bristol to Dubai;
- Edinburgh to Delhi; and
- Birmingham to Tel Aviv.

If APD were abolished, these routes would all become more viable. As highlighted in the previous subsection, APD represents around £500,000 per annum for a daily short-haul connection (or £1 million per annum for domestic connections) and nearly £6 million per annum for a daily long-haul connection. Therefore, abolishing APD could have a very large impact on the viability of many potential new connections where the figures above could make the difference between the flight being operated or not.

5 CONCLUSION

The purpose of this report was to describe how APD impacts on airline route economics. We found that:

- APD represents around 16% of ticket prices for passengers flying point-to-point to short-haul destinations (£13 for the 'reduced' rate), and 18% for long-haul passengers (£78). This rises to 27% and 26% respectively during off-peak periods. We note that these figures are averages, meaning that for some passengers, including those who book in advance and pay lower-than-average prices, APD will be an even higher proportion of the total.
- APD raises around £3.4 billion per year, which is around the same order of magnitude as the DPC revenue generated by all airports in the UK.

We have considered how ticket prices would change following the abolition of APD:

- For routes with marginal viability, the abolition of APD may result in less than full cost pass through but crucially this would boost the overall profitability of the route, which could make the difference between it being viable or not. And clearly having a viable connection for the first time is beneficial to passengers wishing to fly on the route, as well as to the local economies.
- For routes with greater demand, we would expect there to be a greater degree of cost pass through, and therefore lower ticket prices and greater demand, with capacity increasing to meet the extra demand. However, this requires that airlines can actually increase capacity to meet the extra demand.

We have considered how the abolition of APD would impact on new connections in the UK:

- Short-haul: If an airline were to operate a new short-haul connection with an average load of 100 passengers, it would need to generate at least £1,300 per flight just to cover APD, or nearly £500,000 per annum for a daily connection. For domestic connections, where APD is levied on both the outbound and inbound legs, this rises to around £1 million per annum.
- Long-haul: If an airline were to operate a new long-haul connection with an average load of 200 passengers, it would need to generate at least £15,600 per flight just to cover APD, or nearly £6 million per annum for a daily connection. This is particularly significant in the context of the rise of low-cost long-haul.

Or in other words, if APD was abolished, the viability threshold for adding new connections would be lower.

Members of Airlines UK provided us with cost, revenue and demand data on actual routes which they have dropped in recent years on the grounds that they were loss-making. We carried out ex-post APD scenario analysis to consider what the impact of zero APD might have been on ticket prices, demand, and the overall profitability of the routes. We found that of the 8 routes analysed, up to 8 of them (depending on the scenario considered) would have been viable if APD had been abolished. And clearly, had the routes not been cut, this would have benefitted passengers wishing to fly on them.

Finally, we carried out some high level benchmarking analysis to identify potential new connections which could receive a viability boost if APD were abolished. We note that abolishing APD would not necessarily automatically lead to these routes being added. Instead, this is designed to give a flavour of the sorts of routes which could potentially be added. We identified over 60 potential new connections which could be added, all of which would become more viable if APD were abolished.

ANNEX 1: LIST OF POTENTIAL NEW CONNECTIONS

In this section we list the routes which were identified in Section 4.

Domestic connections

Figure 12 Domestic connections

	Origin city	Code	Destination city	Code
1	Aberdeen	ABZ	Nottingham	EMA
2	Aberdeen	ABZ	Liverpool	LPL
3	Birmingham	BHX	Newcastle	NCL
4	Bristol	BRS	Leeds Bradford	LBA
5	Glasgow	GLA	Liverpool	LPL
6	Leeds Bradford	LBA	Bristol	BRS
7	Liverpool	LPL	Glasgow	GLA
8	Liverpool	LPL	Aberdeen	ABZ
9	Liverpool	LPL	Southampton	SOU
10	Liverpool	LPL	London	LHR
11	Liverpool	LPL	London	LGW
12	Liverpool	LPL	London	LCY
13	Liverpool	LPL	London	STN
14	London	LHR	Liverpool	LPL
15	London	LGW	Liverpool	LPL
16	London	STN	Liverpool	LPL
17	London	LCY	Liverpool	LPL
18	Newcastle	NCL	Birmingham	BHX
19	Nottingham	EMA	Aberdeen	ABZ
20	Southampton	SOU	Liverpool	LPL

Source: Frontier analysis based on data from OAG Schedules Analyser

European connections

Figure 13 European connections

	Origin city	Code	Destination city	Code
1	Aberdeen	ABZ	Barcelona	BCN
2	Aberdeen	ABZ	Lanzarote	ACE
3	Aberdeen	ABZ	Duesseldorf	DUS
4	Aberdeen	ABZ	Lisbon	LIS
5	Aberdeen	ABZ	Madrid	MAD
6	Aberdeen	ABZ	Munich	MUC
7	Aberdeen	ABZ	Rome	FCO
8	Aberdeen	ABZ	Brussels	BRU
9	Belfast	BFS	Duesseldorf	DUS
10	Belfast	BFS	Lisbon	LIS
11	Belfast	BHD	Duesseldorf	DUS
12	Belfast	BHD	Lisbon	LIS
13	Belfast	BFS	Madrid	MAD
14	Belfast	BFS	Munich	MUC
15	Belfast	BHD	Madrid	MAD
16	Belfast	BFS	Rome	FCO
17	Belfast	BHD	Rome	FCO
18	Glasgow	GLA	Copenhagen	CPH
19	Glasgow	GLA	Zurich	ZRH
20	Liverpool	LPL	Duesseldorf	DUS
21	Newcastle	NCL	Lisbon	LIS
22	Nottingham	EMA	Duesseldorf	DUS
23	Nottingham	EMA	Lisbon	LIS
24	Nottingham	EMA	Madrid	MAD
25	Southampton	SOU	Barcelona	BCN
26	Southampton	SOU	Tenerife	TFS
27	Southampton	SOU	Lanzarote	ACE
28	Southampton	SOU	Lisbon	LIS
29	Southampton	SOU	Madrid	MAD
30	Southampton	SOU	Rome	FCO
31	Southampton	SOU	Brussels	BRU

Source: Frontier analysis based on data from OAG Schedules Analyser

Long-haul connections

Figure 14 Long-haul connections

	Origin city	Code	Destination city	Code
1	Aberdeen	ABZ	Dubai	DXB
2	Aberdeen	ABZ	Marrakech	RAK
3	Belfast	BFS	Marrakech	RAK
4	Belfast	BHD	Marrakech	RAK
5	Birmingham	BHX	Tel Aviv-yafo	TLV
6	Bristol	BRS	Dubai	DXB
7	Edinburgh	EDI	Dubai	DXB
8	Edinburgh	EDI	Marrakech	RAK
9	Edinburgh	EDI	Tel Aviv-yafo	TLV
10	Edinburgh	EDI	Delhi	DEL
11	Glasgow	GLA	Marrakech	RAK
12	Manchester	MAN	Delhi	DEL
13	Newcastle	NCL	Marrakech	RAK
14	Nottingham	EMA	Marrakech	RAK
15	Southampton	SOU	Marrakech	RAK

Source: Frontier analysis based on data from OAG Schedules Analyser

Member Airlines

About Airlines UK

Airlines UK is the trade association for UK airlines. Our members are British Airways, CargoLogicAir, DHL, easyJet, Flybe, Jet2.com, Norwegian Air UK, Ryanair, Thomas Cook, TUI Airways, Titan Airways, Virgin Atlantic and West Atlantic. In 2017, Airlines UK members employed in excess of 90,000 people, served over 276 million passengers and carried around 1.2 million tonnes of cargo.

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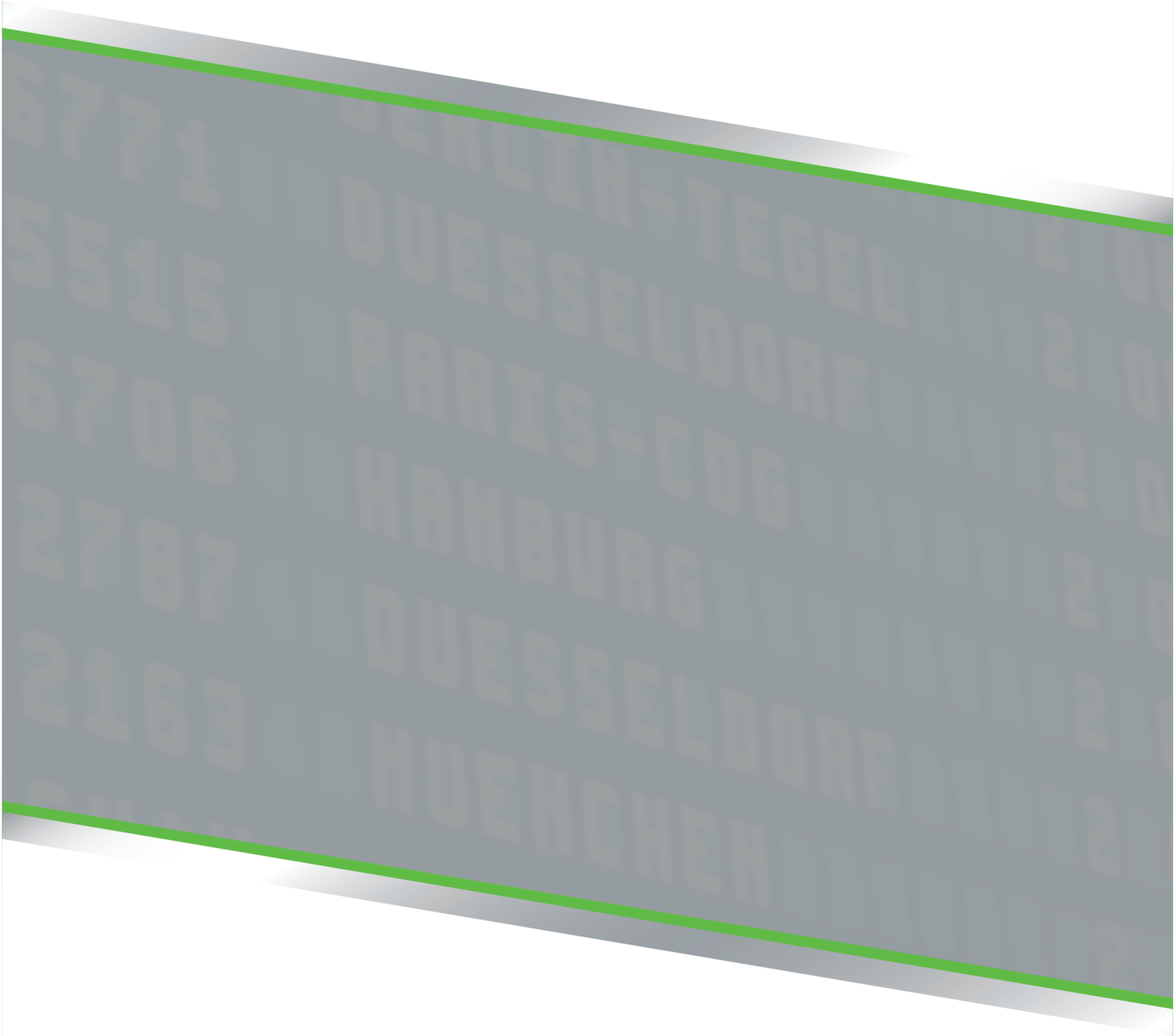

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