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Holding Pattern: An Analysis of Heathrow Airport's Capacity Quandary

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Holding Pattern:
An Analysis of Heathrow Airport's Capacity Quandary

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Submitted in Partial Completion of the Requirements for
Departmental Honors in Aviation Science

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Introduction

One of the most contentious topics of discussion in Aviation today revolves around what many describe as the "overcrowding" of Heathrow Airport in London. Operating at over 99% capacity between its only 2 runways, Heathrow is the world's busiest airport, a title which it has had difficulty taking pride in due to its implications ("Airport Capacity in London," 2013). This has also been an ordeal for passengers navigating through the airport and experiencing the often absurdly long delays as aircraft are kept in holding patterns over the congested airport waiting to land, but also for airlines that have had to pay the airport holding company – Heathrow Airport Holdings – increasingly higher fees to continue operating there ("Company Information," n.d.). The British government has established a number of commissions, including the more recent Airports Commission in 2012 to attempt to resolve this ("About Us," 2015). The only option the commission has determined to be viable is to expand Heathrow Airport with the addition of a third runway (Davies et al., 2015). This option has been quite controversial with many parties within London, especially the residents of the communities surrounding the airport. This project will be taking a deep dive into the airport's rich but troublesome history and consider whether an expansion would really be the most feasible option here or if there are some better options that need to be brought to light. This is a very intricate topic, and this project will emphasize many of the hurdles that have prevented a viable solution from yet being implemented.

Chapter 1: History

In June 1930, Richard Fairey, a British aircraft builder, first opened the Great West

Aerodrome – a humble 150-acre private airport with a single grass runway ("Our History," n.d.).

This was roughly a decade before it was to be taken over by the Royal Air Force during World

War II ("Our History," n.d.). During the second world war, the British government expanded the

airfield by taking over land in and around the village of Heath Row in Middlesex ("Our History,"

n.d.). Six new 9,000-foot runways were built over the existing airfield in a Star of David pattern

("Our History," n.d.). This was no easy task, and so by the time construction was completed, the

military no longer needed the airfield and it was handed over from the Air Ministry to the

Ministry of Civil Aviation in 1946 to become London's newest civil airport, and it was simply

named 'London Airport' (*London Airport*, 1949).

According to historical statistics provided by Heathrow Airport Holdings (n.d.), by the

end of 1946, London Airport saw 63,000 passengers. By 1951, this number had grown to

796,000. That same year, the airport was also rebuilt under the guidance of British architect

Frederick Gibberd to more closely resemble what the airport looks like today. In 1966, the

British Airports Authority is created, and London Airport is officially renamed 'Heathrow'. By

1969, newer terminals were built, and the airport's traffic had grown past five million

passengers. By the end of the 1970's, the airport was seeing 27 million passengers every year

("Our History," n.d.).
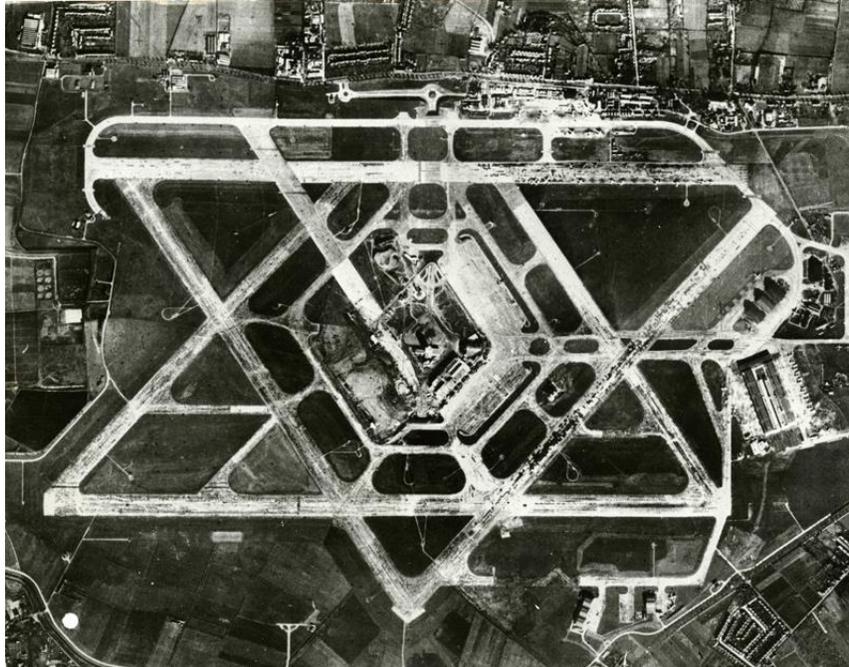
Heathrow Star, 1955. The National Archives UK.

In the following decades, the airport kept on expanding rapidly ("Our History," n.d.).

Newer terminals were built to replace older ones ("Our History," n.d.). Terminal 1 was built in

1969 but was subsequently closed in 2015 to make way for the new Terminal 2, which opened

in 2014 ("Our History," n.d.). This expanded Terminal 2 was to replace the older Terminal 2 built

in 1955 ("Our History," n.d.). The 1960's and 1980's saw the opening of Terminal 3 and

Terminal 4, respectively ("Our History," n.d.). The 2000's saw the opening of the newest

terminal, Terminal 5 ("Our History," n.d.). The planning process for Terminal 5 was the longest

in UK history, taking eight years, and was one of the most expensive as well totaling £80 million

(Vidal, 2007). This, ironically, also served to foreshadow the current inquiry into yet another

likely expansion at Heathrow. In short, Heathrow now has four operational terminals; the new

Terminal 2, Terminal 3, Terminal 4, and Terminal 5. These terminals were built over existing

runways leaving the airport with only two operational runways by the time Terminal 5 was

completed ("Our History," n.d.). The airport has also seen changes in ownership during these

times since it was first transferred from the military to the Ministry of Civil Aviation in 1946.

Heathrow was again transferred in 1965 to the British Airports Authority, which then became

the private entity Heathrow Airport Holdings in 1965 as part of Prime Minister Margaret

Thatcher's efforts to privatize British civil aviation ("The Man Who Bought Trouble," 2007).

Heathrow also saw several iconic aircraft including the Concorde, the Boeing 747, and

the Airbus A380. Larger, faster aircraft also meant more passengers, and so in recent years, the

airport had seen more than 67 million passengers annually ("Our History," n.d.). In 2018, this

number grew to a record 80.1 million passengers, and since there seems to be no signs of a

slow down or decrease to this traffic anytime soon, this record is likely be broken again by the

end of 2019 ("Heathrow Reaches Milestone Year with 80.1 Million Passengers as Revenues

Grow 3%," 2019).

To provide some perspective, between its two runways, Heathrow Airport is legally

capped at 480,000 flights a year; this includes both arrivals and departures of passenger, cargo,

government, and charter flights ("Flight Movements," n.d.). In 2018, Heathrow saw 475,624 Air

Traffic Movements (ATMs) ("Flight Movements," n.d.). This brought Heathrow's capacity to

over 99% capacity, up from 98% for the few years before.

To say that the situation at Heathrow Airport is dire would be a gross understatement.

The only way to effectively coordinate the large number of air movements was to implement a

slot system. The International Air Transport Association, or IATA, implemented this system in

the 1960's to ensure fair competition between airlines at congested airports ("The System for

Allocating Airport Slots Is Broken," 2017). Takeoff and landing slots are allocated by the airport

to airlines on the basis that the airlines can hold on to the slots as long as they use them at least

80% of the time ("The System for Allocating Airport Slots Is Broken," 2017). Since all available

slots at Heathrow have already been allocated, airlines must decide amongst themselves if they

need to hold on to a slot or sell it to another airline that needs it. Over the years, as Heathrow

has become more congested, this slot-controlled system has become very lucrative for airlines.

Thanks to the basic principles of supply and demand, the prices for slots at Heathrow have sky

rocketed. This means that airlines which have managed to hold on to a larger number of them

over the years, like British Airways, are now able to sell them for ludicrous prices. This system is

very much akin to the stock market, where slots are sold and traded for a profit. These slots

often sell for tens of millions of dollars at Heathrow, with the record price currently being $75

million paid by Oman Air to the Air France-KLM group for a single morning arrival ("The System

for Allocating Airport Slots is Broken," 2017).

        Giving airlines this kind of leverage has only served to worsen Heathrow's capacity

situation. This is mainly caused by the arbitrary 80% 'use it or lose it' rule set by IATA. Airlines

have resorted to a number of questionable practices in order to meet this quota, such as

purposely downgauging their flights (using two smaller aircraft to carry passengers when they

could have used one larger aircraft) and flying empty – or 'ghost' – aircraft to low-demand

destinations ("The System for Allocating Airport Slots is Broken," 2017). Since the airport is

limited by the number of aircraft movements that it can handle, unnecessarily flying multiple

smaller aircraft or even empty aircraft use up some of those limited movement slots. In

addition to the unnecessary additional noise and air pollution, these practices have also hurt

competition by making it nearly impossible for new entrants to operate at the airport,

especially low-cost ones. In addition to the limited options for travel, these inflated slot prices

are also being reflected in passenger fare prices.

London Heathrow Airport's tumultuous history has brought it to this current state of

affairs. It is seeing more and more flights every year, and more passengers than ever. Some of

the world's largest airlines, especially the UK's own British Airways, have maintained a

stronghold over its limited capacity, stifling competition and hurting their customers in the

process. The overall experience for passengers has further been diminished due to

overcrowding of its terminals, the oldest of which were never designed to handle that many

people since the original planners did not envision that flying would eventually be accessible to

the masses.

As mentioned before, the passenger experience is further deteriorated due to the

extensive amounts of time that aircraft spend in Heathrow's infamous holding stacks (Millward,

2016). The majority of flights into Heathrow find themselves awaiting in these stacks, and

aircraft generally spend between 20 and 45 minutes in these holding patterns waiting to land

(Millward, 2016). In addition to the delay frustrations and the fuel waste, managing aircraft in

these patterns has also proven to be even more intricate for air traffic control (Millward, 2016).

Beyond these intricacies, this has also proven to be near-fatal. In 2004, a National Air Traffic

Services (NATS) controller had two wide-body aircraft carrying 500 passengers almost collide in

midair while maneuvering them about these stacks (B. Webster, 2004).

So, Heathrow Airport needs to move forward from this. "A cross-party group of

Members of Parliament, the British Infrastructure Group (BIG)" estimates that the airport is

losing £6m a day as a result of the constant delays associated with aircraft holding to land

(Bowler, 2016). The Confederation of British Industry (CBI) projects that Heathrow will also end

up losing up to £30bn by 2030 in trade, passenger traffic and airport fees to other European

hubs like Paris, Frankfurt, and Amsterdam (Bowler, 2016). As Heathrow expanded, so did the

suburban areas around it, and it's very much landlocked at this point. The English government

did foresee Heathrow's current predicament since after the second world war, and put

together many different commissions to address it, like the Roskill Commission from the 1970's

and the more recent Airports Commission from 2012 ("About Us," 2015). The Airports

Commission provided its final report to the Department for Transport in 2015 with a number of

suggestions ranging from attempting to make the use of the existing runways more efficient to

possibly expanding Heathrow and its surrounding airports (Davies et al., 2015). The latter ended

up being the Commission's strongest recommendation, and in the years following the inquiry's

conclusion, different versions of this recommendation have been proposed to parliament for

voting; this process overall has been nothing short of tumultuous (Davies et al., 2015).

      Flights into – and subsequently, out of Heathrow are often delayed due to congestion of

the airfield leading to large numbers of aircraft being stuck in holding patterns over the airport.

These low altitude holding aircraft are burning fuel needlessly and generating far more noise

and air pollution than they would if they were simply able to land in a timely manner. These

holding aircraft are also costing the airport, airlines, and even taxpayers millions of pounds

every day. The current slot-controlled system does not work and has only served to make

things worse. Each of these factors on their own should have served as an impetus for change.

This issue goes beyond party lines, and the amount of misinformation and conflicting interests

surrounding it have only obstructed any actual solutions from being implemented to

definitively resolve Heathrow's longstanding capacity problems.

Chapter 2: To Expand or Not to Expand?

One of the most obvious suggestions that has come up time and time again is to simply expand the airport. The main way to do this would be to build additional runways. This would increase the legal air movement cap and provide additional slots to airlines, making the airport less congested overall. If additional runways were to be built, the logical next steps would also likely involve the construction of new terminals to accommodate potential new traffic. The extent to which the congestion would be alleviated is still a matter of debate. It can also be argued that a third runway would only entice airlines to increase the number of flights they operate and even invite in other airlines that do not currently operate out of Heathrow. Still, additional runways are certainly worth considering as a viable expansion option. There are a number of obstacles, however, which have prevented such an expansion project from being realized.

First, there really is not any land for Heathrow to expand onto currently. As the airport expanded over the decades, so did the population around it. Heathrow is currently surrounded by well-established residential areas, and so any attempts to build an additional runway would involve destroying a number of houses to clear up sufficient land. This would evidently spark outrage from residents as they would need to relocate. Any remaining residents whose homes are not bulldozed would then be subject to increased air and noise pollution. The British government had actually already greenlit an expansion at Heathrow in 2009, but plans were promptly cancelled a year later due to protests by members of the communities surrounding the airport and environmental groups (Walker, 2010). Several civilian action groups were formed, in fact, from the "No 3rd Runway Coalition" to the "No Third Runway Action Group,"

and they insisted that a third runway would only worsen the effects of climate change (Walker,

2010). Another vote took place again in 2018, and despite similar backlash, the House of

Commons again voted overwhelmingly in favor of a third runway at Heathrow to be opened in

2026 (*MPs Back Heathrow*, 2018). The BBC reports that this latest victory was a direct result of

lobbying efforts by The Confederation of British Industry (The CBI) (*MPs Back Heathrow*, 2018).

To address the noise complaints pertaining to a third runway, let's look at the current

utilization of the two existing runways. Heathrow currently uses a 'runway alternation' system

to provide noise relief to the communities around Heathrow ("Runway Alternation," n.d.).

Heathrow Airport Holdings explains that their "alternation pattern means that for part of the

day [they] use one runway for landings and the other for take-offs then, halfway through [the]

day at 3pm, [they] switch over" ("Runway Alternation," n.d.). This pattern is also alternated

weekly and based on takeoff and landing directions – westerly or easterly ("Runway

Alternation," n.d.). They even publish an annual schedule to help residents plan ahead. This is

an extremely complicated process, and airport operations often end up deviating from those

patterns due to unexpected delays that lead to a backlog of flights. Runway alternation would

become exponentially more difficult to plan and adhere to with the addition of a third runway.

Simply getting rid of this system and using both runways simultaneously would increase

capacity by about 15% ("BA Pushes for 'Mixed Mode'," 2007). The airport would need to reach

an agreement with the surrounding communities to operate Heathrow 24 hours a day. This

would only be a temporary stopgap, however, and with the advent of quieter and cleaner

aircraft, this option may not be so implausible and would likely ease the public opinion toward

future expansion projects since it would address the noise and environmental concerns. Merely

doing nothing at the moment is simply not an option, and sooner or later Heathrow will need to actually start work on a feasible expansion option.

This contentious debate has become more interesting as of late due to the parties on each side of the argument. The main parties that stand to benefit from an expanded Heathrow are Heathrow Airport Holdings, other business groups, like the aforementioned CBI, who claim that more passengers flying into Heathrow would have a positive impact on the economy by creating additional jobs, and airlines that currently find it difficult to have a meaningful presence at Heathrow due to the egregious costs of landing and takeoff slots (*MPs Back Heathrow*, 2018). Building additional runways and terminals would indeed create jobs during the construction and may also make Heathrow a more appealing option for businesses if the costs to fly into London are lower. Now, this argument fails to highlight the fact that while the city of London may be a prominent business hub, as in it is a very economically stable centre for various industries, London Heathrow Airport is a hub; as in, a sizeable percentage of the passengers that fly into Heathrow (30.4%) then proceed to connect onto flights to other destinations in Europe, Asia, and Africa ("Facts and Figures," n.d.). This means that over 30% of the people that fly into Heathrow generally do not even set foot in London, and thus do not directly contribute to the economy – beside the upfront fares and fees they pay to the airline.

On the other side of the aisle, some of the vocal critics of an expansion project include the aforementioned residents of the surrounding communities and environmental agencies, the Conservative and Unionist Party, but also British Airways, who originally supported the project, but then reevaluated their position. This was because they deduced that an additional runway (and as such, an increased number of slots) would likely threaten their current

monopoly at Heathrow (Jasper & Wiggins, 2018). Christopher Jasper and Kaye Wiggins, writing

for BloombergQuint, state that

>While IAG [International Airlines Group, British Airways' holding company], which
>
>controls 54 percent of Heathrow's operating slots, would be a prime beneficiary of
>
>additional capacity, the limit on flights has inflated the worth of its existing operation,
>
>bolstering fares on trans-Atlantic routes that are already among the world's most
>
>profitable. (Jasper & Wiggins, 2018)

British Airways also fears that due to the projected costs of these expansion projects, the fees

that the airport charges them would also increase significantly due to their prominent position

at the airport. This would lead to their having to increase their fares to compensate for those

surcharges, which may give their competition an edge with their assumedly lower fees and

fares.

Part of this expansion project would also likely include a radical new terminal –

supposably, Terminal 6, to support the existing 4 terminals. The closing of Terminal 1 in 2015

should have been an opportunity for Heathrow to explore what the future of airport terminals

could really be. Architectural Association School of Architecture graduate, Kjetil Riegel,

conceptualized what such a terminal would be like (Riegel, 2013). The new Terminal 6 could

operate almost entirely remotely. One likely candidate for this virtual new terminal could be

Paddington Station, which many Heathrow passengers already connect through (Riegel, 2013).

Passengers could perform many of the processes involved with their flights (like check-in,

baggage drop, and even security clearance) by the time they arrive at the airport (Riegel, 2013).

Terminal 6 at the airport itself would made up almost entirely out of boarding gates (Riegel,

2013). This would involve a monumental investment into technological advancements and

would require very little additional infrastructure, which could lower costs dramatically. This

option also avoids another issue with all of Heathrow's existing terminals: they are tightly

wedged between its two runways. This interesting design choice has restricted the expansion of

both its terminals and runways. Again, this was done under the presumption that future

expansions would be unlikely because flying would only be reserved for the wealthy. This

proposition has now proven itself to be categorically flawed.

Chapter 3: Northwest Runway

When discussing an additional runway at Heathrow, the most common concept is the 'Northwest Runway' that was recommended by the Airports Commission. That is, a runway which would be built to the northwest of the two existing parallel runways, as can be seen in the below.
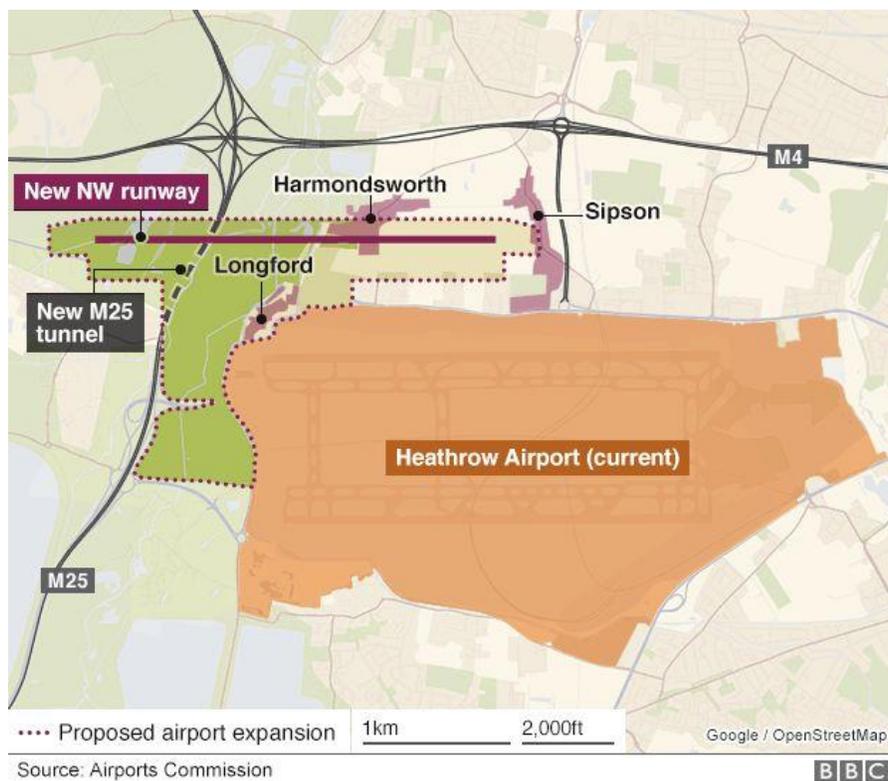
Howard Davies et al., 2015. Department for Transport.

There are a few issues with this design. First, it would require the M25 motorway to either be shifted to the west or have a portion of it be tunneled underneath the runway. This would not only cause disruptions within the airport, but also to the hundreds of thousands of motorists that use London's busiest motorway everyday ("GB Road Traffic," 2010). This option would also likely cause the already astronomical costs of this expansion project to skyrocket. While there is still some speculation about the length of the proposed runway, estimates for a

11,500-foot runway hovered steadily around £16.5 billion (Heathrow Expansion Costs, 2017).

The BBC reports that Heathrow Airport Holdings, the airport's owner, has proposed a 1,000-

foot reduction to the total length, which would reduce costs by about £2.5 billion, bringing the

total cost down to £14 billion (Heathrow Expansion Costs, 2017). Now, the length of the runway

could prove to be crucial. Simon Calder, writing for The Independent, suggested that one of the

initial solutions put forward to solve Heathrow's capacity problems was to incentivize "airlines

to use bigger aircraft, and to fill them with more passengers" (Calder, 2018). While this would

translate to fewer aircraft utilizing the runways, the runways would also need to be long

enough to accommodate these larger aircraft. Boeing's latest jumbo jet, for example, the 747-8

requires around 10,000 feet of runway to takeoff under standard atmospheric conditions (747-

8 Airplane Characteristics, 2012). With the current proposed shorter length for this new

runway, such an aircraft would generally not be able to takeoff safely from the runway.

Another major issue for airlines is that filling an aircraft with passengers is a lot easier

said than done. Airlines have always operated using a hub-and-spoke model; that is, they use

smaller aircraft to bring passengers in from smaller airports to their hubs, like Heathrow, and

then fly them to their international destinations. This model has been in a steady decline over

the past decades as passengers have developed an aversion to connecting flights, and so

airlines have been transitioning to a point-to-point model – flying passengers on smaller aircraft

from their local airports directly to their final destinations. While it is unclear whether these

two models will be able to coexist in the future, if a new runway is going to be built at a hub like

Heathrow, it must be built to be able to accommodate whatever type of aircraft the next few

decades may bring. After all, it is a lack of foresight in planning that has worsened over the years to lead to this current dilemma.

Naturally, one of the public's main concerns is how this will all be financed. Both Heathrow Airport Holdings and the U.K. government have insisted that the expansion project will be privately funded. Financial Times reports that Heathrow's financials have been somewhat shaky, however (Plimmer & Ford, 2018). While they could certainly convince their shareholders that this endeavour could be fruitful in the distant future, that is not at all guaranteed (Plimmer & Ford, 2018). This would again beg the question of whose interests are actually being furthered with these expansion projects. Airlines fear that they would end up having to pay for a portion of the costs, which would then trickle down to their passengers. Politicians and the general public are concerned that taxpayer dollars may end up having to be used toward a project which does not at all seem to align with their interests. Heathrow Airport Holdings has tried their best to reassure those concerned but have yet been able to provide any concrete assurances that airline fees would not be significantly impacted, and that taxpayer dollar use would be minimal at worst.

Another one of the main concerns with a third runway at Heathrow include the looming implication that houses would need to be demolished to make way for the new runway. That is the primary reason for the Northwest shift, actually. Heathrow Airport Holdings, in cooperation with the British government have established what they call a 'Compulsory Purchase Zone' or CPZ ("Compensation Schemes," n.d.). This is similar to eminent domain in the United States, but a lot more complicated. Per the below, this CPZ would include half of the village of Harmondsworth. This means that an estimated 250 houses in those parts of Harmondsworth

would end up being destroyed (Bell, 2016). An estimated 700 residents would end up being

displaced ("Local Statistics," 2011). Heathrow is offering to covering the full value of these

homes, as well as an additional 25% of the value to affected residents ("Compensation

Schemes," n.d.). They will also cover the costs for any other additional property loss, as well as

legal and moving costs ("Compensation Schemes," n.d.). While these offers would not cover

any lost history or emotional attachments associated with these structures, they would

certainly ensure that these affected residents are not worse off than they were before. In

addition to the CPZ, Heathrow Airport Holdings is also looking to compensate communities in

the WPOZ, or Wider Property Offer Zone. While the houses in these villages would be largely

unaffected, Heathrow "recognize[s] that people who own and occupy properties outside the

CPZ but within very close proximity to the airport boundary are also affected by [their]

activities" ("Compensation Schemes," n.d.).
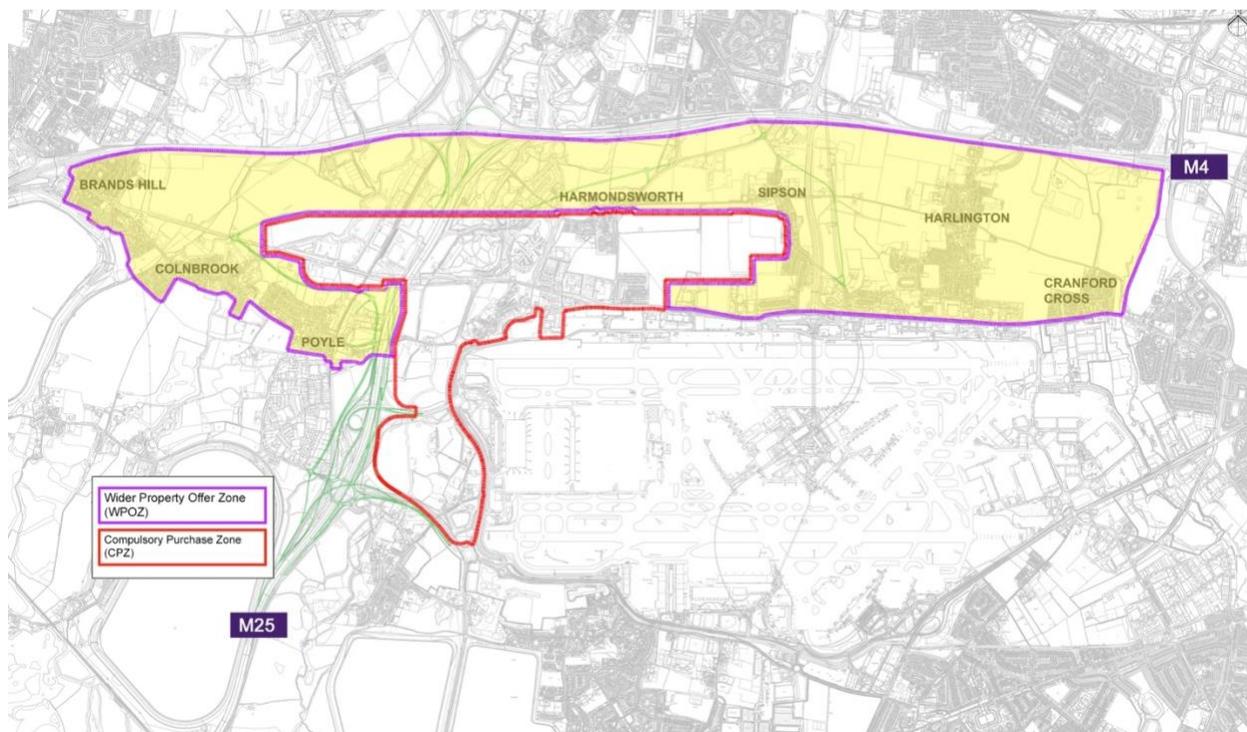
Heathrow also

> estimate[s] there are approximately 5,500 residential properties within the wider
>
> property offer zone. These properties are located in Poyle, Colnbrook, Brands Hill,
>
> Harlington, Cranford Cross and parts of Harmondsworth and Sipson. Of the 5,500, [they]
>
> estimate there are up to 3,750 eligible residential properties within this zone.
>
> ("Compensation Schemes," n.d.)

For these residents, Heathrow is offering the same compensation offers as for the residents in

the CPZ. They are also offering further compensation for noise disturbances, as well as noise

mitigation options, which include insulation packages for home owners ("Compensation

Schemes," n.d.). The earliest this process could start taking place is in 2021. This is so Heathrow

Airport Holdings can continue conducting consultations with these communities, as well as

working out the legal aspects of compulsory land purchases with the British government.

Heathrow also has yet to disclose the source of the funds that will cover this compensation

scheme.

The M25 motorway will also have to be built over, as mentioned before, and while the

widespread disruptions to traffic could potentially be overlooked under the pretense that there

are really no other options location-wise for this runway, the costs for shifting an entire

motorway are a lot harder to come to terms with. Estimates for these massive infrastructure

changes actually exceed the cost of the runway itself, at £15 billion, and unlike the runway, it is

almost definite that taxpayers would need to foot the bill according to former transport

secretary Justine Greening (Calder, 2018).

There are also some seldom-discussed issues related the Heathrow's current runways and the addition of a northwest runway. Heathrow currently has two parallel runways numbered 09L/27R and 09R/27L ("EGLL," n.d.). This is a very popular runway configuration for many airports, but there are still some concerns associated with it. The runways being so similarly numbered may lead to confusion for pilots at takeoff and landing. Heathrow is a bit different, however, due to the large amount of space between its two parallel runways where the terminals are conveniently located. Having runways with different headings also comes in handy in windy conditions. If there is a significant crosswind component to one runway preventing its use, the same will also apply to the other runway as they are parallel. Given its space constraints, the third northwest parallel runway is really the most sensible option for Heathrow right now. This would likely lead to the runways being renamed as 9L/27R, 09C/27C, and 09R/27L. This is not ideal, but other airports have managed it; Hartsfield–Jackson Atlanta International Airport, for example, has an astounding 5 parallel runways, though some changes had to be made to their nomenclature. Heathrow could also simply expand to the west into the Wraysbury Reservoir. This would have the least impact on residential communities but would still be disruptive to the M25. This would however translate to end-to-end parallel runways, which would be a safety and operational nightmare, mainly because of the aforementioned runway direction and naming issues. A possibly angled Northwest is still the most feasible option here.

As far as a timeline goes, Heathrow Airport Holdings is claiming that this project can be completed within the next 5 years, but realistic estimates have been roughly 3 times longer than that (Calder, 2018). If no action is taken, Heathrow is expected to reach 100% capacity

within the next 5 years as well (Calder, 2018). Now, with these massive investments of time and

funds, and no shortage of public backlash, one cannot help but wonder how much of a

difference would expanding Heathrow actually make in the long run. Capacity would actually

increase from 480,000 aircraft movements to 740,000, a 54% increase (Calder, 2018).

Passenger traffic would naturally increase by around 16 million by 2040 as well (Calder, 2018).

Still, Heathrow would probably be able to stave off another capacity crisis for the next several

decades, if not century. The two primary concerns with the third runway – noise and pollution –

are likely to be addressed with technological advancements as the world prepares to welcome

its first hybrid aircraft, currently being pioneered by Boeing ("Boeing," 2012). Boeing has also

made strides in noise reduction with its Boeing 787 Dreamliner, an extremely fuel-efficient

widebody aircraft with serrated engine cowlings which dramatically reduce noise pollution.

Manufacturers have also been experimenting with ultra-high-bypass turbofans, like propfans,

and variable pitch fan blades for further environmental improvements and noise reductions.

The world is currently experiencing a 'green wave' as people become more

conscientious of the environment around them and the potentially devastating effects of

climate change, and while many airliners in their current state are large contributors to

greenhouse gas emissions, it would be beyond myopic to maintain the mindset that putting

down a few slabs of cement to prepare for the future of worldwide interconnectivity will also

somehow directly translate to climate-change Armageddon. While it is perfectly wise to be

skeptical of some of these private entities' motives for wanting to expand the airport, the

looming capacity catastrophe still cannot simply be dismissed. This goes beyond Heathrow

Airport. Despite there being many other large European hubs, like Paris, Frankfurt, and

Amsterdam, London will always remain the hub of choice for many passengers worldwide

thanks in large part to its central location in the Western world and the city's rich history.

Chapter 4: Other London Airports and Boris Island

London Heathrow is certainly not the only airport in London. It is most definitely not the only large airport either. Some of these other major airports include London City Airport (currently at 59% capacity), London Gatwick (78%), London Luton (80%), London Southend (32%), and London Stansted (55%) (*Airport Market Power Assessments*, 2012). A lot of the current traffic at Heathrow could theoretically be rerouted through some of these airports. London Gatwick has already become a major secondary airport for low-cost airlines that are not able to fly into Heathrow. Unfortunately, these other airports are not able to accommodate the widebody aircraft which make up a bulk of Heathrow's current traffic

Most of these airports, with the exception of City, which was built in 1987, share a very similar history to Heathrow – they started out as private aerodromes that were then sequestered by the British government for the war efforts, and then expanded after the wars to accommodate passenger traffic (Foreman, 2014a). The government had correctly predicted in the 1950's that capacity would become an issue in the future and had hoped that traffic would be spread out relatively evenly across these airports. As history has shown, that is unfortunately not what happened. Heathrow just kept growing, and the only reason airlines would fly to London's other airports is due to there not being enough takeoff and landing slots at Heathrow. Thanks to the lower capacity at these airports, fees are also lower and so it is a lot more affordable for airlines to operate there. While the government had hoped that traffic would be shared between these airports, they never actually established the infrastructure to facilitate this. Not only are some of these airports actually not located in London, despite their names – London Luton and London Stansted being the worst offenders, located more than 30

miles and 40 miles away from London, respectively – but efficient transportation between them

is virtually nonexistent (Foreman, 2014a). Because of this, Gatwick, being London's second

largest airport, only sees less than half of Heathrow's traffic (Foreman, 2014a). This will, of

course, now raise the issue of ensuring proper transportation methods between all these

airports to help them captivate a significant enough portion of the market – that has relied on

Heathrow and had never before considered an alternative airport – to make the endeavour

worthwhile. Again, this would mostly be the 6% domestic market traffic that Heathrow

currently sees, and so this would not make a significant enough difference to put Heathrow in

the clear again – they would still need to expand ("Facts and Figures," n.d.).

Furthermore, Gatwick is currently at 78% capacity operating with a single runway. If it

continues operating as-is, it should not encounter any problems for the next several decades.

However, if it was to become a 'sister' hub to Heathrow, it too would need an additional

runway to accommodate the additional traffic. Unlike Heathrow, luckily, Gatwick is not as

landlocked by suburban areas and so the public backlash for fear of having their homes

bulldozed and the increased noise pollution would definitely be a lot less prominent. Still, the

costs for a second runway at Gatwick would be on par with those for a third runway at

Heathrow. Moreover, a double-hub system is simply a terrible idea. The fundamental idea

behind a hub-and-spoke system is that there will be a lot of traffic (the spokes) converging into

a central point – the hub. Having two hubs would complicate how this traffic is routed

exponentially and it would be nearly impossible for airlines to not favor one hub over another,

rather than ensuring equal amounts of traffic to and from both hubs. It would also be

frustratingly inefficient for passengers as they may end up having to commute between the two

hubs for a connecting flight. The infrastructure to regularly trek these roughly 40 miles between

the two airports is simply not there yet either. Passengers would need to find their way around

the already congested M25 motorway, which would take roughly 45 minutes to an hour, or

take public transport, which could end up taking up to two hours. Considering that 94% of

Heathrow's traffic is international, those passengers would have to cope with this added stress.

Since the whole premise behind trying to maintain Heathrow as a central European hub

involves enticing foreign entities to do business in London or to connect on to other

international destinations ("Facts and Figures," n.d.). Having to find their way around an

obfuscated double hub system would most definitely not be conducive toward this goal.

Stansted and Luton airport have both offered themselves to become sister hubs to

Heathrow (Foreman, 2014a). In addition to the aforementioned reasons against a double-hub

system, Stansted, the most viable candidate after Gatwick thanks to it being the third largest

airport 'in' London is a substantial 60 miles away from Heathrow.

There is one more airport in London that could be the be-all and end-all to solving all of

Heathrow's capacity problems several times over: the Thames Estuary Airport. It has an

astounding 6 runways, plenty of room to expand if needed (though it definitely would not need

to) as there are no communities around it for miles. It could completely replace Heathrow

Airport as London's hub. There is just one small issue with the Thames Estuary Airport: it does

not exist yet. At least, it has not be been built yet. Though the idea for it had been floating

around as early as the 1940's, it was first formally conceived of in 1971 as a result of the

findings of the Roskill Commission, or the Commission on the Third London Airport (Helsey &

Codd, 2012). The Roskill Commission was so named after one of the U.K.'s High Court Judges,

Eustace Wentworth Roskill, Baron Roskill (Helsey & Codd, 2012). Parliament was receptive to

the idea, but no further work was done toward it because of the 1973 oil crisis (Helsey & Codd,

2012). The proposal has since come up time and time again whenever Heathrow's capacity

problems are being discussed.

More recently, London Mayor Boris Johnson put forward his proposal for the airport

based on studies that he performed (Helsey & Codd, 2012). The Thames Estuary Airport thus

earned the moniker "Boris Island". In addition to "Boris Island," many other versions of this

same concept have been put forward under different names, like London Britannia Airport and

Thames Hub Airport (P. J. Davies & Pickford, 2013). The airport would be built on the Isle of

Grain and would extend into the estuary using reclaimed land (Helsey & Codd, 2012). A

comparison of the Thames Estuary from Bing Maps can be seen below on the left, as well as a

conceptual render by Isabelle Lomholt for e-architect on the right.

Thames Estuary. Bing Maps.   Lomholt, 2014. e-architect.

Now, there would again be the issue of costs. Since the Thames Hub is still very much a

concept, it's unclear whose ownership it would fall under, and as such, who would be paying to

build it. The Thames estuary is also roughly 40 miles to the east of London, and 50 miles away

from Heathrow. The infrastructure to conveniently connect London to the Thames Estuary

would increase the costs exponentially, and the whole project could end up taking upwards of

30 years to complete, by which time it may not even be necessary anymore as airlines would

have shifted their attention to other European hubs (Foreman, 2014b). The main flaw,

however, with this airport and all the other existing London airports is quite simple, really:

they're not in London. There really is no way around this encumbrance.

Chapter 5: Large Hubs Overseas

For some perspective, it is important to look at other airports around the world that

may have already encountered a similar predicament as Heathrow or at risk of doing so, and

how they counteracted it.

Compared to the rest of the world's airports, U.K.'s Heathrow finds itself in an

interesting position. England is a relatively small country, land-wise, and relatively densely

populated. This makes a large, accessible central hub in its largest city all the more important.

The United States is far larger than England, and as such, has many major cities. While the hub-

and-spoke model is definitely in widespread use in the United States, there are many secondary

hubs in many cities. New York, for example, has its major hub, John F. Kennedy International

Airport (JFK), but also a secondary hub, LaGuardia Airport (LGA). The main reason New York is

able to operate a double-hub system is because most of the air traffic in the United States is

actually domestic; 83%, in fact, of the air traffic in the United States – according to the Bureau

of Transportation Statistics – is domestic, compared to England's 6% ("2017 U.S. Airline Traffic

Data," 2018). As such, carriers will often have domestic hubs, like LaGuardia, and international

hubs, like JFK. Furthermore, American cities have ample land to expand any of their major

airports if needed, like Hartsfield-Jackson Atlanta International Airport (which is already the

largest airport in the world and is still surrounded by empty fields), Los Angeles International

Airport, and Chicago O'Hare International Airport ("World Airport Traffic," 2019). This

important distinction in the type of traffic seen, domestic and international, is the main

takeaway here, still. Carriers, both foreign and domestic, have started to embrace these

double-hub and point-to-point models. Moreover, passengers in the U.S. are more receptive to

connecting flights, as are international passengers, since the majority of these connections stay

within the United States. With Heathrow being a relatively smaller country and holding its

status as a European hub, this intrinsically means that people will usually be flying out to other

cities within the U.K itself or out into Europe, Africa, and Asia.

In contrast, some East Asian countries like South Korea and Japan which have been

seeing exponential growth in passenger traffic and are smaller in size and a lot more densely

populated than England (Yamaguchi, 2013). These countries have only seen major development

for the past few decades however, and so their governments employed a lot more forethought

in their planning as they would not have the same constraints that Heathrow suffers from as a

result of its history. For example, in addition to Narita International Airport and Osaka

International Airport, Japan began operating Haneda Airport and Kansai International Airport

shortly thereafter in anticipation of an overcrowding situation (Yamaguchi, 2013). South Korea,

on the other hand, took the Thames Estuary approach with its Incheon International Airport in

Seoul and simply decided to expand it into the ocean with the use of reclaimed land (Shin &

Shin, 1998). Hong Kong took a similar approach by creating an entirely new artificial island for

its Hong Kong International Airport (P. J. Davies & Pickford, 2013). The issue with Kansai,

Incheon, Hong Kong, and all other reclaimed land projects is that over time, the ocean has a

tendency to claim this land back. As such, the airport must constantly be monitored to ensure

that its sink rate is within reason, which adds to labor and materials costs.

The best option for Heathrow here is still to expand. Airport expansions have

proven to be successful worldwide. The only thing left to figure out is how Heathrow will go

about doing this in their own way that works for London and the U.K. as a whole.

Conclusion

If Heathrow Airport is to maintain its 'major European hub' status, a few things need to happen. First, it will need to relinquish any terminal leisure traffic to its sister airports and focus solely on international, business, and connecting traffic. It will still need a third runway; there is no way around this. This runway would preferably be to the north of the existing two runways. This would have no direct impact on the M25 motorway, but the communities of Harlington, Harmondsworth, Sipson, and Longford would need to relocate. While it may seem callous, it still remains that city planners should have never allowed communities to settle in close proximity to such a large airport in the first place. With the privatization of the aviation industry in the U.K., any attempts to regulate, modify, or expand an airport's operations have become infinitely more intricate. In the U.S., all international airports are under the purview of public or semi-public agencies. As such, the federal government is able to regulate construction around the airport based on Part 77 of the Federal Aviation Regulations. Let's say one of the U.S.' major hubs were to find itself in a similar predicament as Heathrow, the Federal Government could simply make any necessary expansions by acquiring the land around the airport through eminent domain.

That would mean that the U.K. may seriously need to reconsider undoing some of Margaret Thatcher's damage and make its airports public again. This would eliminate all the uncertainty around the holding company's motives since the airport would be owned by the people. The U.K. aviation industry is likely to see some very aggressive changes already as a result of their imminent exit from the European Union. Brexit will most definitely have a negative impact on Heathrow as British citizens may now start to encounter visa restrictions

when traveling into Schengen area nations and outside of Europe. While this transition will be

difficult regardless, the English government may take this opportunity to take control of its

airports again. Even if they wish to avoid such a drastic change to their current system – as

there will most definitely be backlash from these private entities trying to protect their assets –

the government may still wish to employ Heathrow Airport Holding's compensation scheme

and other incentives for people to move out of these communities, which, in the long run

would really solve most of these parties' issues.

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