Title: Night Flight Restrictions at the Designated Airports, 2017-2022 **IA No:** DfT00370 **RPC Reference No: RPC-3554(1)-DfT** **Lead department or agency:** Department for Transport **Other departments or agencies:**	**Impact Assessment (IA)** **Date:** 16/11/2016 **Stage:** Consultation **Source of intervention: Domestic** **Type of measure:** Secondary legislation **Contact for enquiries:** David Hyde, night.flights@dft.gsi.gov.uk
Summary: Intervention and Options	**RPC Opinion:** Green

Cost of Preferred (or more likely) Option				
Total Net Present Value	**Business Net Present Value**	**Net cost to business per year** (EANDCB in 2014 prices)	**One-In, Three-Out**	**Business Impact Target Status**
NQ	NQ	NQ	In Scope	Qualifying provision

What is the problem under consideration? Why is government intervention necessary?

There is a need to protect local communities from the negative impacts of aircraft noise at night, while permitting the operation of services that provide benefits to the aviation industry and wider economy. As set out in the 2013 Aviation Policy Framework (APF), the Government recognises that night noise is the least acceptable form of aircraft noise and as a result it is necessary to ensure that the economic benefits of night flights are balanced with the costs these can impose on communities, including sleep disturbance. Heathrow (LHR), Stansted (STN) and Gatwick (LGW) are designated under section 78 of the Civil Aviation Act 1982 and there are currently night flights restrictions in place at these airports. However, the current night flight regime expires in October 2017 due to a sunset clause, further detail of this regime can be found in the Evidence base. Not replacing the regime and allowing unlimited flights is not a realistic option, since a previous legal judgment on the night flights regime has ruled that the Government has an obligation to balance the rights of those persons living near airports with the economic interests of those operating and benefiting from those flights. Government is therefore responsible for deciding the night flight regime that should apply at these airports from October 2017.

What are the policy objectives and the intended effects?

Directive 2002/30/EC governs rules on the adoption of operating restrictions before 13 June 2017 such as the night flight regime and requires them to be no more restrictive than is needed to achieve the environmental objectives for that airport. The proposed objective is to encourage the use of quieter aircraft to limit or reduce the number of people significantly affected by aircraft noise at night, while maintaining the existing benefits of night flights.

What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)

It is not possible to ensure the environmental objective is delivered without regulation, this is discussed further in the evidence base.

- **Option 1: Do nothing**: the current regime is continued with no changes - a significant number of aircraft remain exempt, specifically at Stansted, and Gatwick and Heathrow continue to have capacity to increase the amount of noise energy that can be emitted.
- **Option 2:** Implementation of new QC/0.125 category, and incorporate QC/0 aircraft into movement limits for all three airports.
- **Option 3**: Policy Option 2 and accommodate currently exempt aircraft by increasing Stansted's movement limit.
- **Option 4a:** As option 3 and reduce noise quota limits at Heathrow and Gatwick to a level based on the current average QC per movement (joint preferred).
- **Option 4b**: As option 4a and further reduce the noise quota limits at all airports gradually over the regime period, for example by 5% per year (joint preferred).

Our preferred options balance the economic benefits from night flights at the three airports with the noise disbenefits to communities in order to deliver on the environmental objective. The objective is to encourage the use of quieter aircraft to limit or reduce the number of people significantly affected by aircraft noise at night, while maintaining the existing benefits of night flights. We are awaiting further evidence to decide what the optimal reduction at each airport would be under option 4b and which of our preferred options is best suited to achieve our objective. This will ensure the best possible reduction in noise whilst maintaining the benefits that night flights at these airports offer. Further information can be found in Section 12.

Will the policy be reviewed? Yes	**If applicable, set review date: October 2022**			
Does implementation go beyond minimum EU requirements?		N/A		
Are any of these organisations in scope?	**Micro** Yes	**Small** Yes	**Medium** Yes	**Large** Yes
What is the CO_2 equivalent change in greenhouse gas emissions? (Million tonnes CO_2 equivalent)		**Traded:** N/A	**Non-traded:** N/A	

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

LORD (TARIQ) AHMAD OF WIMBLEDON

Minister for Aviation, Department for Transport

Signed by the responsible Minister: Date: 05/12/16

Summary: Analysis & Evidence Policy Option 2

Description: Implementation of new QC/0.125 category, and incorporate QC/0 aircraft into movement limits for all three airports.

FULL ECONOMIC ASSESSMENT

Price Base Year 2015	PV Base Year 2015	Time Period Years 5	Net Benefit (Present Value (PV)) (£m)		
			Low: N/A	High: N/A	Best Estimate: £0.27m

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	NQ	N/A	NQ	**NQ**
High	NQ		NQ	**NQ**
Best Estimate	NQ		NQ	**NQ**

Description and scale of key monetised costs by 'main affected groups'

Given the limitations of the available evidence, none of the potential costs identified for this option have been monetised in this IA.

Other key non-monetised costs by 'main affected groups'

Across the 5 year regime, it is estimated there would be around 750 fewer flights in the night quota period at Gatwick and around 5,860 fewer flights in the night quota period at Stansted compared to the Do Nothing scenario. As a result, it is expected that there would be a number of costs to businesses, passengers and the government (see Section 8.2.2 for more details). The non-monetised costs are expected to be higher at Stansted than at Gatwick. In addition, it is estimated that would be no change in the number of night flights at Heathrow. Therefore, no costs are expected at Heathrow.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	NQ	N/A	NQ	**NQ**
High	NQ		NQ	**NQ**
Best Estimate	NQ		£0.06m	**£0.27m**

Description and scale of key monetised benefits by 'main affected groups'

It is estimated that Option 2 would result in a total reduction in noise costs in the night quota period over the 5 year regime of around £14,460 at Gatwick and around £254,750 at Stansted (in present value terms).

Other key non-monetised benefits by 'main affected groups'

It is estimated that the population within the 48dBA LAeq, 6.5hr night contour[1] would be unchanged in 2017/18 and reduced by around 50 people in 2021/22 (around 1%) at Gatwick; and would be reduced by around 150 people in 2017/18 (around 4%) and around 100 people in 2021/22 (around 2%) at Stansted. The non-monetised benefits are therefore expected to be higher at Stansted than at Gatwick. Furthermore, at all three airports, introducing a new QC category and counting all movements towards the limit will increase the transparency of the regime and provide more certainty for communities on the number of flights that can take place in the night quota period.

[1] A description of this contour can be found in Section 8.1.4 of the Evidence Base

Key assumptions/sensitivities/risks	**Discount rate (%)**	3.5%
Our analysis currently has a number of limitations, which means that the results of the quantitative analysis for all of the policy options under consideration that are presented in this IA are subject to considerable uncertainty. This means that there is uncertainty around both the impacts on the policy options and any comparisons that are made between the policy options in this IA. Please refer to Section 7 and Section 8 of the Evidence base for a full discussion of the limitations of this analysis.		

BUSINESS ASSESSMENT (Option 2)

Direct impact on business (Equivalent Annual) £m:			**Score for Business Impact Target (qualifying provisions only) £m:**
Costs: NQ	**Benefits:** NQ	**Net:** NQ	NQ

Summary: Analysis & Evidence — Policy Option 3

Description: As Policy Option 2 and accommodate currently exempt aircraft by increasing Stansted's movement limit.

FULL ECONOMIC ASSESSMENT

Price Base Year 2015	PV Base Year 2015	Time Period Years 5	Net Benefit (Present Value (PV)) (£m)		
			Low: N/A	**High: N/A**	**Best Estimate: £0.01m**

COSTS (£m)	**Total Transition** (Constant Price) Years		**Average Annual** (excl. Transition) (Constant Price)	**Total Cost** (Present Value)
Low	NQ	N/A	NQ	**NQ**
High	NQ		NQ	**NQ**
Best Estimate	NQ		NQ	**NQ**

Description and scale of key monetised costs by 'main affected groups'

Given the limitations of the available evidence, none of the potential costs identified for this option have been monetised in this IA.

Other key non-monetised costs by 'main affected groups'

It is expected that the number of flights in the night quota period at Stansted under Option 3 would decrease compared to the Do Nothing scenario but that the decrease under Option 3 would be lower than under Option 2. Therefore, the costs at Stansted are expected to be lower under Option 3 than under Option 2. This policy option is the same as Option 2 for Heathrow and Gatwick. Therefore, the costs at Gatwick are expected to be the same as under Option 2 and it is expected that there would be no costs at Heathrow.

BENEFITS (£m)	**Total Transition** (Constant Price) Years		**Average Annual** (excl. Transition) (Constant Price)	**Total Benefit** (Present Value)
Low	NQ	N/A	NQ	**NQ**
High	NQ		NQ	**NQ**
Best Estimate	NQ		£0.00m	**£0.01m**

Description and scale of key monetised benefits by 'main affected groups'

It is estimated that Option 3 would result in a total reduction in noise costs in the night quota period over the 5 year regime of around £14,460 at Gatwick (in present value terms). This is the same as under Option 2.

Other key non-monetised benefits by 'main affected groups'

It is expected that the number of flights in the night quota period at Stansted under Option 3 would decrease compared to the Do Nothing scenario but that the decrease under Option 3 would be lower than under Option 2. Therefore, the benefits at Stansted are expected to be lower under Option 3 than under Option 2. This policy option is the same as Option 2 for Heathrow and Gatwick. Therefore, the benefits at Heathrow and Gatwick are expected to be the same as under Option 2.

Key assumptions/sensitivities/risks	**Discount rate (%)**	3.5%
The limitations of the analysis explained in Option 2 are applicable to Option 3. In addition, it has not been possible to include estimates of the value of the reduction in noise costs in the night quota period at Stansted under Option 3. This is because the limitations of our forecasts mean that applying the same approach as for Option 2 provides results that are not consistent with what we expect the direction of the impacts of this option to be. We have therefore not included this analysis in this IA, but we hope to include analysis of this in our final-stage IA. Please refer to Section 8.3 of the Evidence base for further information.		

BUSINESS ASSESSMENT (Option 3)

Direct impact on business (Equivalent Annual) £m:			**Score for Business Impact Target (qualifying provisions only) £m:**
Costs: NQ	**Benefits:** NQ	**Net:** NQ	NQ

Summary: Analysis & Evidence — Policy Option 4a

Description: As Policy Option 3 and reduce noise quota limits at Heathrow and Gatwick to a level based on the current average QC per movement.

FULL ECONOMIC ASSESSMENT

Price Base Year	PV Base Year	Time Period Years	Net Benefit (Present Value (PV)) (£m)		
			Low: NQ	High: NQ	Best Estimate: £0.01m
2015	2015	5			

COSTS (£m)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	NQ	N/A	NQ	**NQ**
High	NQ		NQ	**NQ**
Best Estimate	NQ		NQ	**NQ**

Description and scale of key monetised costs by 'main affected groups'

Given the limitations of the available evidence, none of the potential costs identified for this option have been monetised in this IA.

Other key non-monetised costs by 'main affected groups'

It is estimated that the number of flights in the night quota period at Gatwick would the same as under Option 2 and this policy option is the same as Option 3 for Stansted. Therefore, the costs at Gatwick are expected to be the same as under Option 2 and the costs at Stansted are expected to the same as under Option 3. In addition, it is estimated that would be no change in the number of night flights at Heathrow. Therefore, no costs are expected at Heathrow.

BENEFITS (£m)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	NQ	N/A	NQ	**NQ**
High	NQ		NQ	**NQ**
Best Estimate	NQ		£0.00m	**£0.01m**

Description and scale of key monetised benefits by 'main affected groups'

It is estimated that Option 4a would result in a total reduction in noise costs in the night quota period over the 5 year regime of around £14,460 at Gatwick (in present value terms). This is the same as under Option 2.

Other key non-monetised benefits by 'main affected groups'

The benefits at Stansted are expected to be the same as under Option 3. At Heathrow and Gatwick, the benefits are expected to be the same as under Option 2, plus, although reducing the noise quota limits at Heathrow and Gatwick is not expected to have any impact on the number of flights in the night quota period at these airports, Option 4a would also help to lock in the benefits of quieter aircraft that have been achieved over recent years.

Key assumptions/sensitivities/risks — **Discount rate** 3.5%

The limitations of the analysis explained in Option 2 and Option 3 are also applicable to Option 4a.

BUSINESS ASSESSMENT (Option 4a)

Direct impact on business (Equivalent Annual) £m:			**Score for Business Impact Target (qualifying provisions only) £m:**
Costs: NQ	**Benefits:** NQ	**Net:** NQ	NQ

Summary: Analysis & Evidence — Policy Option 4b

Description: As Policy Option 4a and further reduce the noise quota limits at all airports gradually over the regime period, for example by 5% per year

FULL ECONOMIC ASSESSMENT

Price Base Year 2015	PV Base Year 2015	Time Period Years 5	Net Benefit (Present Value (PV)) (£m)		
			Low: NQ	**High: NQ**	**Best Estimate: £0.40m**

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	NQ	N/A	NQ	**NQ**
High	NQ		NQ	**NQ**
Best Estimate	NQ		NQ	**NQ**

Description and scale of key monetised costs by 'main affected groups'

Given the limitations of the available evidence, none of the potential costs identified for this option have been monetised.

Other key non-monetised costs by 'main affected groups'

Across the 5 year regime, it is estimated there would be around 5,380 fewer flights in the night quota period at Gatwick and around 5,490 fewer flights in the night quota period at Stansted compared to the Do Nothing scenario. These estimates imply that the costs at Stansted would be similar to Option 2 and the costs at Gatwick would be higher than Option 2. In addition, it is estimated that there would be no change in the number of night flights at Heathrow. Therefore, no costs are expected at Heathrow.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	NQ	N/A	NQ	**NQ**
High	NQ		NQ	**NQ**
Best Estimate	NQ		£0.09m	**£0.40m**

Description and scale of key monetised benefits by 'main affected groups'

It is estimated that Option 4b would result in a total reduction in noise costs in the night quota period over the 5 year regime of around £151,640 at Gatwick and around £243,580 at Stansted (in present value terms).

Other key non-monetised benefits by 'main affected groups'

It is estimated that the population within the 48dBA LAeq, 6.5hr night contour would be unchanged in 2017/18 and reduced by around 600 people in 2021/22 (around 13%) at Gatwick; and reduced by 50 people in 2017/18 (around 1%) and by around 350 people in 2021/22 (around 9%) at Stansted. The estimated reduction in the total number of flights in the night quota period at Gatwick and Stansted across the 5 year regime under Option 4b implies that the benefits would be larger than Option 2 at Gatwick and at a similar level to Option 2 at Stansted. At Heathrow, the benefits are expected to be the same as under Option 2, plus, although reducing the noise quota limits at Heathrow is not expected to have any impact on the number of night flights at Heathrow, Option 4b would also help to lock in the benefits of quieter aircraft that have been achieved over recent years.

Key assumptions/sensitivities/risks	**Discount rate (%)**	3.5%
The risks with the analysis that are outlined in Option 2 are also applicable to Option 4b.		

BUSINESS ASSESSMENT (Option 4b)

Direct impact on business (Equivalent Annual) £m:			**Score for Business Impact Target (qualifying provisions only) £m:**
Costs: NQ	**Benefits:** NQ	**Net:** NQ	NQ

Evidence Base

We hope to receive relevant evidence through our consultation in order to improve our analysis. We have highlighted a range of areas where we would particularly welcome stakeholders input in sections: 5, 6, 6.2.6, 7.1.2, 7.1.4, 7.3, 8.2.2, 10, 11, 11.1, 11.2 and 12. Stakeholders may respond via the online survey or via email. The relevant questions are summarised in Appendix G.

1 Background

There is a need to protect local communities from the negative impacts of aircraft noise at night, while permitting the operation of services that provide benefits to the aviation industry and wider economy. As set out in the 2013 APF, the Government recognises that night noise is the least acceptable form of aircraft noise and as a result it is necessary to ensure that the economic benefits of night flights are balanced with the costs these can impose on communities, including sleep disturbance.[2]

1.1 Current Regime

Night flight restrictions of some form have been in place at Heathrow since 1962, Gatwick since 1971 and Stansted since 1978. The underlying principle of the restrictions has been to balance the benefits of night flight for the aviation industry and wider economy with the negative impacts of night noise on local communities.

Since 1993, the main elements of the night noise regime have been limits to the number of movements and amount of noise that can be emitted at an airport between the hours of 23:30 and 06:00, which is known as the night quota period, during a particular season (there are two seasons per annum, winter and summer, which coincide with the use of Greenwich Mean Time and British Summer Time).

The limits for the three airports for the current regime, which began in October 2014 and runs to October 2017, are shown in Figure 1 below:

Figure 1 - Seasonal night movement and noise quota limits for Heathrow, Gatwick and Stansted

	Heathrow	Gatwick	Stansted
Summer night movement limit	3,250	11,200	7,000
Summer noise quota limit	5,100	6,200	4,650
Winter night movement limit	2,550	3,250	5,000
Winter noise quota limit	4,080	2,000	3,310

The noise quota limits are based on the noise classification of aircraft. All aircraft are given a Quota Count (QC) number based on their noise during take-off and landing with those with higher QC classifications using a greater amount of an airports noise quota (see Appendix C). The noise quota limit is designed to encourage the use of quieter aircraft by allowing airports to maximise the number of movements during any season through the use of aircraft with a lower quota count. Currently the

[2] *DfT (2013) 'Aviation Policy Framework' https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/153776/aviation-policy-framework.pdf*

lowest QC category is QC/0.25 and applies to aircraft with and a noise level between 84 to 86.9 EPNdB[3]. Aircraft that are quieter than this are currently rated QC/0 and are exempt from the restrictions. This means they are not subject to either the movement or noise quota limits and can operate unrestricted in the night quota period.

There are also dispensations for certain types of movements that do not count towards the movement or noise quota limits, for example humanitarian or VIP flights, or in the event of emergencies, widespread and prolonged air traffic disruption. No changes to the rules regarding dispensations are being considered as part of this review of the restrictions. Therefore, the statistics and estimates presented in this impact assessment and the analysis described in this impact assessment do not cover flights that have been or would be granted dispensations.

1.2 Carry overs and Overruns

As airline seasons vary in length, airports are given flexibility to manage their allowance, and may carry-over unused movements or quota from one season to another, or may over-run in one season which leads to a deduction in the following season. The current rules for carry-overs and overruns are as follows:

- If required, a shortfall in use of the movements limits and/or noise quota in one season of up to 10% may be carried over to the next season;
- Conversely, up to 10% of an overrun in movements and/or noise quota usage in one season (not being covered by carry-over from the previous season) will be deducted from the corresponding allocation in the following season;
- An overrun of more than 10% will result in a deduction of 10% plus twice the amount of the excess over 10% from the corresponding allocation in the following season; and
- The absolute maximum overrun is 20% of the original limit in each case.

2 Problem under consideration / Rationale for intervention

The biggest issue arising from night flights is the effect of night noise on residents in areas surrounding airports. In particular, the impact this has on sleeping patterns of individuals. There has been growing evidence on the relationship between exposure to higher levels of aircraft noise at night, sleep disturbance, and adverse health effects. Thus, there is a need to balance these adverse impacts on local residents with the economic benefits the night flights offer to the aviation industry and wider economy. See Section 6.1.1 for a detailed discussion of the noise impacts of night flights.

The power for the Secretary of State to set night flight restrictions for designated airports is granted under section 78 of the 1982 Civil Aviation Act. This allows action to be taken to avoid, limit or mitigate noise from aircraft. Heathrow, Gatwick and Stansted airports have been designated for this purpose since 1971. These are the only three airports that the Government currently designates for these purposes. While the Government only sets night flight restrictions at these three airports, they are representative of restrictions set elsewhere – which are often the result of local planning conditions. Government policy, as set out in the APF in 2013, is that in general noise controls are best agreed locally. But, given the strategic importance of these airports to the UK economy, and that their future was being considered by the Airports Commission at the time, the APF stated that it was appropriate for the Government to continue to maintain the status of the designated airports. Therefore the Government currently sets noise controls at these airports, including night flight restrictions, to continue to balance the economic benefits these airports offer to the UK with the impacts they impose on communities.

[3] Effective Perceived Noise level in decibels

In our upcoming review of airspace and noise policies, we will be considering what the Government's role should be in setting noise controls at these airports in the future. Without prejudice to the outcome of that process, the Government needs to provide certainty on the night flights rules which will apply at the three airports when the current regime lapses. Given the need to consult now, the restrictions from October 2017 will be set before any decisions have been made on the future of the Government's role. Due to the rules governing the introduction of operating restrictions, and the need for Government to consult before any changes to the existing method of regulation of noise at these airports are made, airports would not be able to voluntarily introduce restrictions before the current regime lapsed.[4] At this moment in time therefore, government regulation is the only option to ensure night flights are adequately managed.

A failure to act could lead to a substantial increase in the number of night flights at any of the three airports. Given the noise disbenefits of these flights, this is not considered a viable option. Plus, intervention is required in this market as an unregulated market would almost certainly impose a disproportionate negative impact on communities around an airport regarding, for example, night noise and air quality.

3 Policy Objective

The night flight restrictions set by the Government are an example of noise-related operating restrictions and there is European legislation governing the introduction of these at airports, based on ICAO's balanced approach. New requirements on the introduction of operating restrictions came into effect on 13 June 2016 under Regulation (EU) 598/2014. The Government began engaging with stakeholders as part of its consultation process in time to make use of transitional arrangements allowed under this Regulation and therefore this review of the restrictions is being carried out in accordance with the predecessor legislation, Directive 2002/30/EC. The deadline for making use of these transitional arrangements has now passed. Given the greater notification period required under the new regulation, there would not be time for operating restrictions, including voluntary ones, to be introduced by other means without the restrictions lapsing.

On 23 June, the EU referendum took place and the people of the United Kingdom voted to leave the European Union. Until exit negotiations are concluded, the UK remains a full member of the European Union and all the rights and obligations of EU membership remain in force. During this period the Government will continue to negotiate, implement and apply EU legislation. The outcome of these negotiations will determine what arrangements apply in relation to EU legislation in future once the UK has left the EU.

One of the requirements of the Directive is for any action taken by a competent authority (the Secretary of State in this instance), to be no more restrictive than is needed to achieve the

[4] New Regulations concerning the introduction of operating restrictions came into effect on 13 June 2014. This requires six months' notice of any new operating restrictions (including voluntary restrictions), ending at least two months prior to the determination of the slot coordination parameters as defined in point (m) of Article 2 of Council Regulation (EEC) No 95/93 (1). For restrictions beginning in October 2017, this would require a decision to be made by September 2016. The Government began this process under transitional arrangements allowed under previous legislation and a different notification period therefore applies.

environmental objectives for that airport. The Government must therefore give consideration to what are appropriate environmental objectives for each airport.

When the regime was last reviewed the Government decided it should maintain a stable regulatory regime and allow growth within the existing movement limits and noise quotas, pending a decision on airport capacity. No significant changes were therefore made to the previous restrictions.

Given the recent developments in relation to airport capacity already summarised, and the fact there are expected to be new night flight restrictions associated with a new runway, the Government agrees with the Airports Commission's recommendation that there is no case for further restrictions on the number of night flights at a capacity constrained Heathrow[5]. The next night flights regime at Heathrow should ensure therefore that the existing benefits of night flights at Heathrow are maintained, but also deliver the best improvement in the noise climate possible in the period before a new runway is in place - through incentives to encourage the use of the quietest aircraft in the night quota period.

The Government believes the same aims should apply at Gatwick and Stansted. Gatwick already has a large number of flights in the night quota period during the summer season compared to other airports. There is however still capacity in the winter season and, given the constraints on airport capacity in the south east, the Government does not think it appropriate to constrain this further. The airport is likely to be considering its future strategy following the Government's decision to choose Heathrow as its preferred scheme for delivering new airport capacity in the south east. Until a strategy is developed, encouraging the use of quieter aircraft would help to ensure there is an improvement in the noise climate around the airport while ensuring the existing benefits of night flights are maintained.

At Stansted, like Gatwick, the airport is utilising its full allowance in the summer season but has spare capacity in the winter season. Stansted's intention to seek planning permission in the coming months will give them the opportunity to reach a local agreement on night flight restrictions that is acceptable to both the airport and local communities. Encouraging the use of quieter aircraft in the night quota period while maintaining the existing benefits of night flights would therefore avoid making changes that pre-empted these future considerations while ensuring the airport is not allowed to make more noise than is currently allowed.

As a result, for all three airports, we propose an environmental objective to '**encourage the use of quieter aircraft to limit or reduce the number of people significantly affected by aircraft noise at night, while maintaining the existing benefits of night flights'.**

4 Considerations for the Policy Options

4.1 The growth and potential future increase in the number of exempt aircraft under the current regime

As explained above in Section 1.1, some aircraft fall outside of the current regime and are therefore exempt from both the movement and noise quota limits. When the regime was first set in its current format in 1993, it was originally proposed that aircraft below QC/1 (90EPNdB[6]) should be exempt from the regime. A Department of Transport sleep study[7] had suggested that noise below 80 dB Lmax (90 EPNdB equates to roughly 75 dB Lmax[8]), was unlikely to cause sleep disturbance[9]. After consultation,

[5] Airports Commission. Final Report (2015).
[6] EPNdB; Effective Perceived Noise Decibels. A specialised noise unit used for aircraft noise certification tests. Figures based on average of flyover and sideline for departures, and after 9 EPNdB subtraction from approach value.
[7] Ollerhead J B et al, Report of a Field Study of Aircraft Noise and Sleep Disturbance, Department of Transport, December 1992.
[8] Lmax; The maximum A-weighted sound level (in dBA) measured during an aircraft flyby
[9] SONA Analysis completed for Department for Transport. To be published in 2017 alongside the upcoming airspace and noise consultation

it was decided that a QC/0.5 category should be adopted, with aircraft quieter than this exempt from the restrictions.

Since 1993, evidence of the relationship between noise exposure, sleep disturbance and health impacts has increased. This evidence informed the 1999 World Health Organization (WHO) Guidelines for Community Noise[10], stating that noise events exceeding 45 dBA[11] Lmax indoors should be limited if possible. It noted that it should be possible to sleep with a bedroom window slightly open (a reduction from outside to inside of 15 dB[12]), therefore equating to an outdoor Lmax of 60 dBA.

Although currently exempt aircraft are quieter than those included in the limits, they do create noise that could result in sleep disturbance. However, since the introduction of the QC/0.25 category in winter 2006/07, the existence of this exempt category did not result in a significant difference between the total number of movements in the night quota period compared to the number allowed under the regime for much of the following period.

This has begun to change in recent years at Stansted (see Figure 2 and Figure 3 below). In Summer 2016, the number of exempt operations would not have been accommodated in the current movement limits, even with the use of carry-over and a 10% overrun[13]. Plus, at Gatwick, the issue has potential to become more important during the next regime. Currently the majority of exempt aircraft are small freighters and business jets. But, over the next few years, several new quieter jet aircraft, such as versions of the Airbus A320neo, will come into service that have the potential to be quieter than the current QC/0.25 standard and therefore exempt from both the movement and the quota limits under the current restrictions.

The largest airlines at Gatwick and Stansted, easyJet and Ryanair respectively, have a large number of these aircraft on order. EasyJet expect about a third of their fleet to be comprised of Airbus A320neos by 2021[14] and Ryanair also have 100 confirmed orders for the Boeing 737-MAX.[15]

Thus, there is the possibility for commercial airlines to operate a potentially unlimited number of these aircraft during the night quota period. This could have significant impacts on the noise climate around airports, and therefore result in adverse health impacts. Additionally, there could be impacts on air quality and climate change. This means it is necessary for the Government to consider what proportionate regulation of these aircraft would be. As it stands, the restrictions at these airports would not be transparent and would fail to reassure communities of the maximum level of night noise they could be expected to be exposed to in the night quota period.

[10] World Health Organisation. WHO Guidelines for Community Noise (1999) http://www.who.int/docstore/peh/noise/guidelines2.html

[11] dBA; A-weighted decibels. Unit of sound pressure level measured on the A-weighted scale i.e. as measured on an instrument that applies a weighting to the electrical signal as a way of simulating the way a typical human ear responds to a range of acoustic frequencies.

[12] dB; Unit of relative sound level or changes in sound level

[13] This is the maximum percentage overrun an airport can use without facing a penalty (losing two movements for every one over this level). Therefore, we assume airports will not exceed a 10% overrun.

[14] easyjet. Press Release. 7th November 2015. http://www.airbus.com/presscentre/pressreleases/press-release-detail/detail/easyjet-orders-an-additional-36-a320-family-aircraft/

[15] Boeing. Press Release. 8th September 2014. http://boeing.mediaroom.com/2014-09-08-Boeing-Launches-737-MAX-200-with-Ryanair

Figure 2 - Number of exempt movements in the winter season

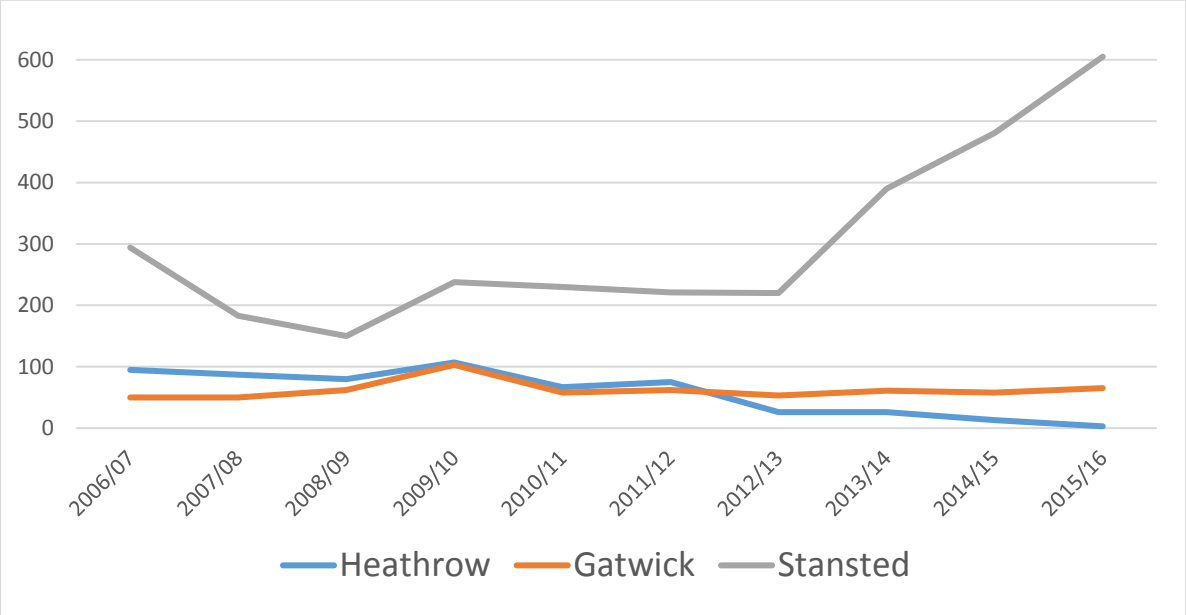
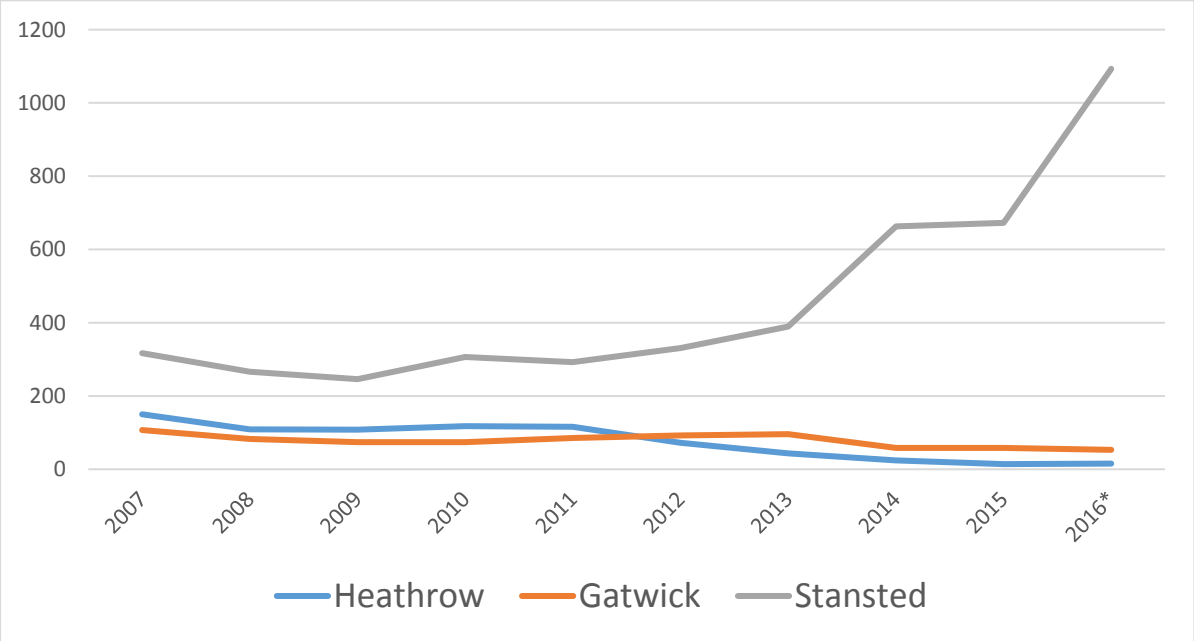


Figure 3 - Number of exempt movements in the summer season



* Data for summer 2016 has not been quality assured by Heathrow at this time, thus it may be subject to change.

As can be seen from Figure 2 and Figure 3 above, Gatwick and Heathrow currently have a far smaller number of exempt movements compared to Stansted. However, this increase in exempt movements from the introduction of these new aircraft could be particularly noticeable at Gatwick since existing A320s make up a significant proportion of night movements[16].

[16] CAA data

4.2 Whether the airports' movement limits remain appropriate

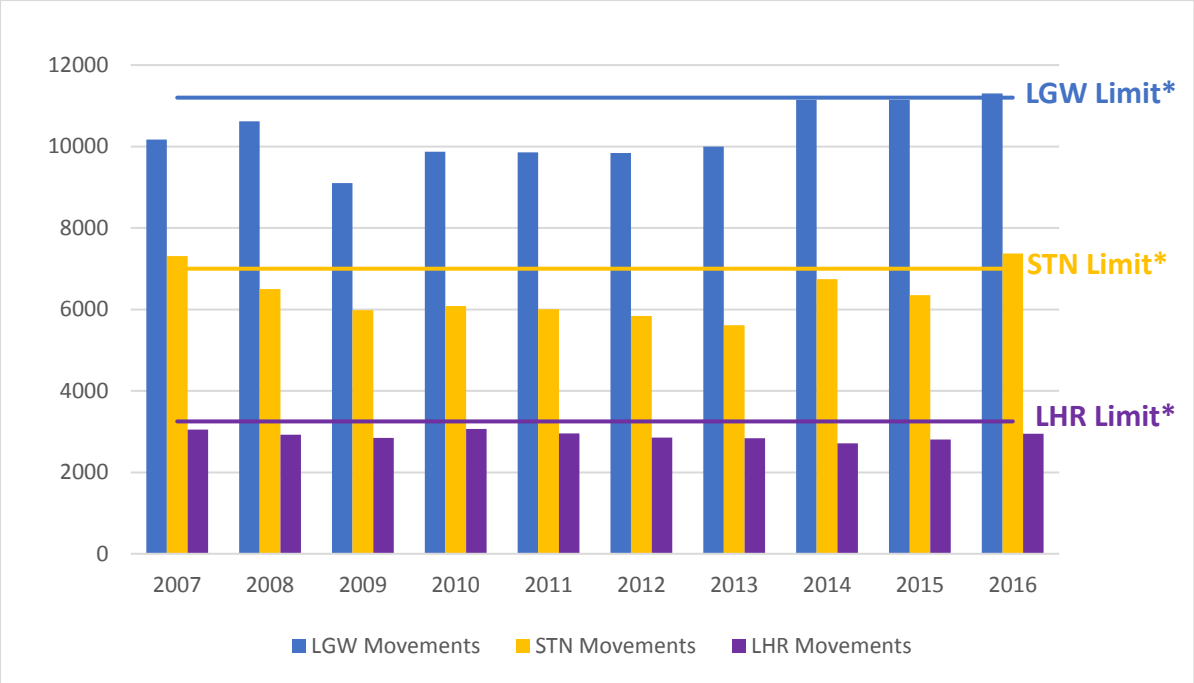
Along with the noise quota limits, the movement limit for each airport is the key element of the restrictions. When the regime was last reviewed, it was decided to make no changes to the movement limits in order to 'maintain a stable regulatory regime pending decisions on future airport capacity'. The Government has now indicated that its preferred scheme for consulting on new runway capacity in the south east is Heathrow. It is therefore appropriate to consider when setting the new regime whether the movement limits at these airports are still appropriate. However, as outlined in Section 3, part of our environmental objective required under the Balanced Approach is to maintain the existing benefits of night flights at these airports.

4.3 Whether the airports' noise quota limits remains appropriate

As with the movement limits, it was decided when the regime was last reviewed to make no changes to the airports' noise quota limits. The purpose of a noise quota limit alongside a movement limit is to incentivise the use of quieter aircraft to maximise the number of flights that can take place during the night quota period. Improvements in aircraft's noise performance over recent years has meant that at Heathrow and Gatwick, proportionally less of the airports' noise quotas are being used compared to movement limits. Thus, the regime is not incentivising the use of quieter aircraft as much as it could do, and nor is it preventing airlines from hypothetically replacing an aircraft with a noisier one. Reviewing the noise quota limits will allow the Government to consider how it can ensure the benefits of new aircraft technology are shared and communities are given more certainty as to the level of noise they will experience in the night quota period.

Figure 4, Figure 5, Figure 6 and Figure 7 below show the movement and noise quota (QC) usage at all three airports in recent years, split by season. They show how close each airport is to their limit in any given season (excluding any carry over from previous season and any over-run).

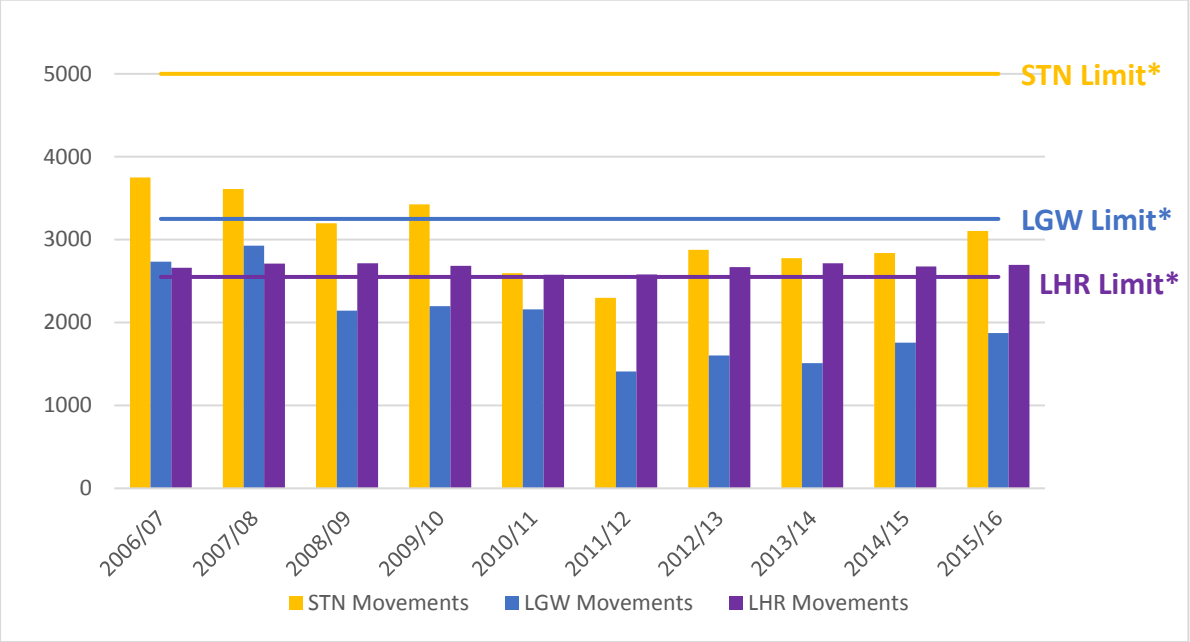
Figure 4 - Summer movement usage



* Refers to seasonal movement limit excluding any carry over from previous season and any over-run

Source: DfT data

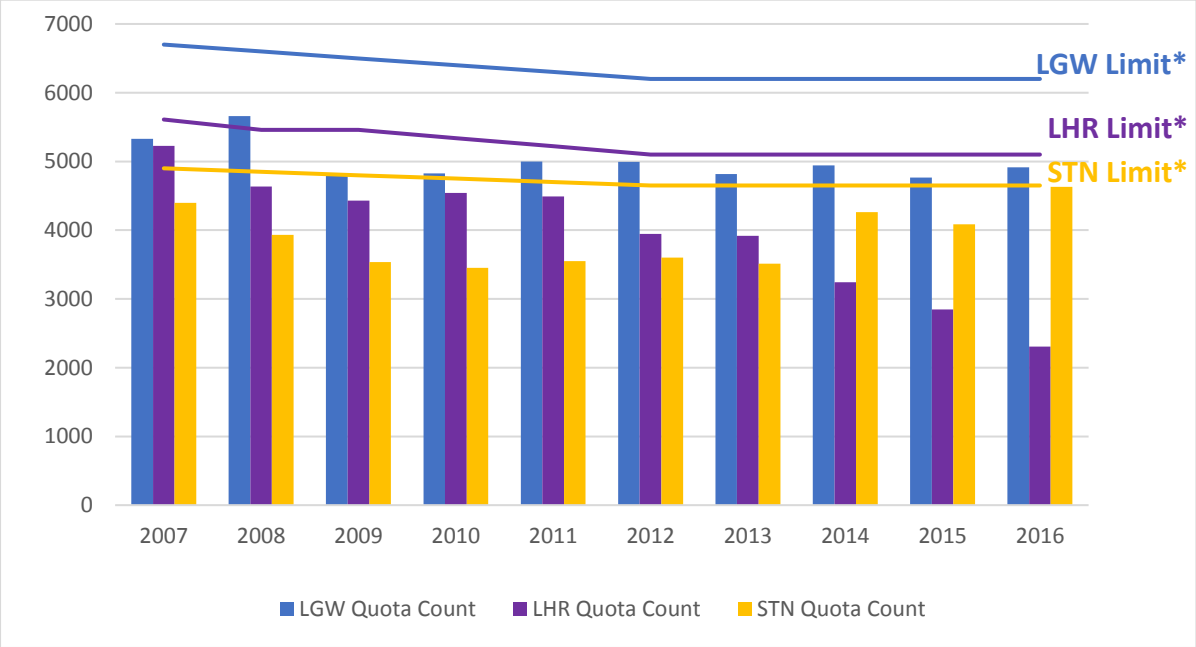
Figure 5 - Winter movement usage



* Refers to seasonal movement limit excluding any carry over from previous season and any over-run

Source: DfT data

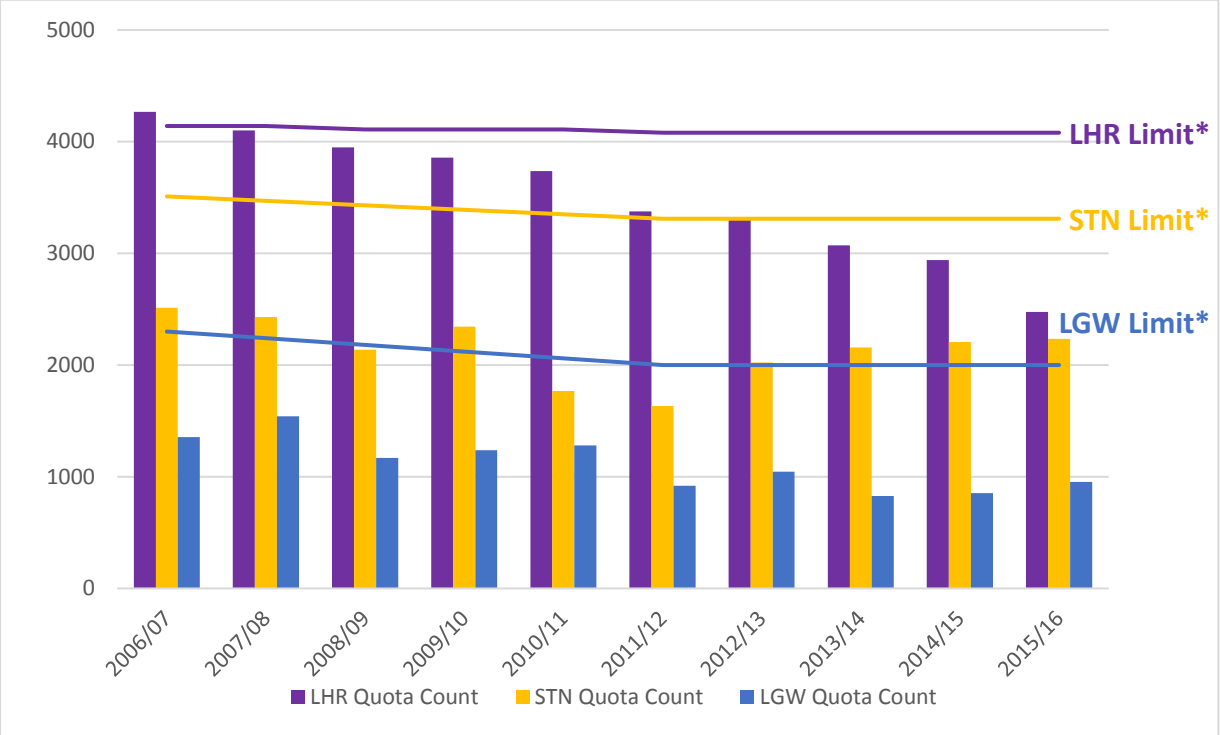
Figure 6 - Summer noise quota usage



* Refers to seasonal noise quota limit excluding any carry over from previous season and any over-run

Source: DfT data

Figure 7 - Winter noise quota usage



* Refers to seasonal noise quota limit excluding any carry over from previous season and any over-run
Source: DfT data

5 Description of options considered

Given the considerations outlined above and the overarching environmental objective, the policy options proposed are:

1. Do Nothing
2. Implementation of QC/0.125 category, and incorporate QC/0 aircraft into movement limits for all three airports
3. As 2, plus uplift movement limits at Stansted by the current number of QC/0 movements

4a. As 3, plus reduce noise quota limits at Heathrow and Gatwick

4b. As 4a, plus reduce quota limits gradually over the 5 year regime at all three airports by 20%, for example.

Our preferred option is either 4a or 4b. We aim to use the consultation to reach our conclusion and hope to receive evidence on the expected impacts of the options to help us decide which of these options is best suited to achieve our environmental objective.

5.1 Alternatives to regulation

As stated in Section 2, current Government policy is that these airports are strategically important to the UK economy and it is therefore right that Government balances the benefits of night flights with the costs they have on communities. While the Government intends to review its role at these airports shortly, it is not possible for any changes to be made without proper public consultation. Our consultation makes clear however that if changes to the Government's role are made as a result of that process, then the Government would allow more bespoke arrangements to be made at these

airports in the future. This is provided there has been appropriate consultation and all legal requirements have been followed. It is possible for these changes to take effect before the end of the regime currently being considered. In purely practical terms, the legal requirements governing the introduction of operating restrictions would mean there would not be sufficient time for airports to give the required notice for any voluntary operating restrictions before the regime lapses.

The next night flights regime will be set out in accordance with Directive 2002/30/EC and SI 2003/1742, The Aerodromes (Noise Restrictions) (Rules and Procedures) Regulations 2003, which implements the Directive in the UK. The Directive requires noise to be managed in line with ICAO's Balanced Approach. Therefore, action to address noise around an airport should be addressed in the most cost-effective way, with operating restrictions, such as the night flights regime, only being introduced if the environmental objective for an airport cannot be achieved by any other means. In addition to operating restrictions, the Balanced Approach identifies three other mechanisms for addressing noise:

5.1.1 Reduction of noise at source

Aircraft have become quieter in recent years and new quieter aircraft will continue to come into operation over the next few years. However, as Appendix F demonstrates, even the quietest commercial aircraft that will operate in the next few years will still produce noise levels which could lead to sleep disturbance.

5.1.2 Land-use planning

The Government's National Planning Policy Framework (NPPF) aims to prevent development where noise can give rise to adverse effects. Research carried out by the CAA, which will be published shortly, suggests Government policy, along with regulatory levers, have had success in preventing inappropriate residential development in the areas subjected to the highest noise impacts.

5.1.3 Operational procedures

The Government already sets various operational procedures at these airports that are designed to minimise the impact of noise on communities. These include continuous climb and descent operations and minimum heights at which aircraft must join the instrument landing system (ILS). Airspace modernisation may also offer new opportunities in this area over the next few years.

These alternative measures are discussed in more detail in the consultation document this Impact Assessment accompanies. While these measures can all offer benefits for the noise environment, failure to set limits on the number of flights and noise energy that can be emitted would mean aircraft would be allowed to operate without any restrictions during the night. Even with the developments described above and those expected in the next few years, failure to set appropriate limits would not adequately protect communities with the negative consequences of aircraft noise at night. This would also mean a failure to reach the environmental objective.

5.2 No Action

In the absence of Government intervention, the existing Night Flight Restrictions at Gatwick, Heathrow and Stansted would end in October 2017. Unlike at other airports, where such restrictions are agreed locally, the Secretary of State has responsibility for ensuring there are suitable mechanisms in place at these airports to protect communities from the harmful impacts of aircraft noise, while also considering the economic benefits of night flights. A 'No Action' scenario would result in no night flying

restrictions at these airports beyond October 2017. This would be considered a failure of meeting the Government's long term policy to limit and, where possible, reduce the number of people significantly affected by aircraft noise, as well as the environmental objectives set. Thus, we do not consider this a viable option for our 'Do Nothing' scenario.

5.3 Do Nothing

For the purpose of assessing policy options, the effective 'Do Nothing' scenario is considered to be a continuation of the current regime, which we define for the purposes of this IA, as maintaining the current movement and noise quota limits at all three airports with no changes to the structure of the regime.

Given the importance of making this IA as easily understandable as possible, and the Secretary of State's responsibility for ensuring there are suitable mechanisms in place at these airports to protect communities from the harmful impacts of aircraft noise, we feel that this is the most appropriate 'Do Nothing' scenario.

Firstly, using this scenario will help to ensure communities and industry can better interpret and consider the impacts of the policy options proposed as all comparisons are being made relative to the current situation. The current regime is largely a continuation of that first set in 2006 – the last time there was a change to movement limits - and is therefore regarded as the status quo by affected parties.

Secondly, previous legal judgments[17] on the night flights regime have also ruled that night flights adversely affect the rights of people living near airports; and that the Government has an obligation to balance the rights of those persons with the economic interests of those operating and benefiting from those flights.

While we are using this scenario as the 'Do Nothing' option for our analysis due to the lack of viability of a 'No Action' scenario, we do not believe continuing the current regime is appropriate at this time. The rationale that the previous regime was set under is no longer valid due to the Government's decision on airport capacity in the south east. Other developments such as the increase in existing exempt aircraft as well as the anticipated introduction of new exempt aircraft also necessitate changes from the existing regime.

5.4 Policy option 2 - Implementation of QC/0.125 category, and incorporate QC/0 aircraft into movement limits for all three airports.

This policy option would involve the creation of a new QC/0.125 category of aircraft with a noise level between 81 and 83.9 EPNdB, which would capture some of the aircraft that would otherwise be exempt from the night flights restrictions. In addition, under this policy option, all movements by aircraft quieter than 81 EPNdB would also now count towards the movement limits. However, QC/0 aircraft (below 81 EPNdB) would continue not to count towards the noise quota limits.

These changes would ensure there is transparency with regards to the number of noise events communities could expect to be exposed to and protect communities from a potentially unlimited

[17] Hatton and Others v. United Kingdom (Application no. 36022/97) European Court of Human Rights http://www.richardbuxton.co.uk/transcripts/hatton-and-others-v-united-kingdom

number of such flights which could operate outside of the restrictions. QC/0 aircraft will remain exempt from the noise quota limit in order to incentivise the use of quieter aircraft.

There would be no changes to the movement or noise quota limits in this option. The aircraft that we expect would fall under QC/0.125 in our appraisal period are listed in Appendix A.

5.5 Policy Option 3 – As Policy Option 2 and uplift movement limits at Stansted by the current number of movements by QC/0 aircraft.

In addition to the creation of a new QC category and all movements counting towards the movement limit, this policy option would involve uplifting the movement limits at Stansted by the number of QC/0 movements that are currently exempt under the regime. This would be based on the number of such movements that occurred in the winter 2015/16 and summer 2016 seasons. Stansted's noise quota limits would remain the same under this option. The number of exempt movements in the most recent winter and summer seasons were 605 and 1,093 respectively, thus we propose an uplift of 600 movements in the winter and 1,100 in the summer.[18]

This uplift would ensure Stansted is not disproportionately affected by the change to the rules on exempt aircraft, and ensure that the benefits of existing night flights are maintained, as per our environmental objective. Plus, leaving the noise quota limits at the current level would ensure the benefits of these quieter aircraft are shared between the communities and the industry. This would avoid the Government pre-empting future decisions on night flight restrictions at Stansted, allowing the airport to potentially agree a local night flights decision when seeking future planning permission. This would be in line with the Government's preferred approach that noise controls should be agreed locally where possible.

We have also considered the movement limits at Heathrow and Gatwick. With regards to Heathrow, the Government has announced it expects a ban on movements of six and a half hours during the night period as a condition on expansion. The airport has also indicated that it is willing to introduce a ban before a new runway is operational, subject to planning permission to increase its capacity in the interim. The Government agrees however with the Airports Commission's recommendation that there is no case for further restrictions on the number of night flights whilst there are the current capacity constraints at Heathrow. Heathrow has also indicated that it is not looking to increase its permitted number of night flights. The Government therefore believes it is appropriate to retain the current movement limits until any new night flight restrictions associated with expansion, including those that might be introduced early if a suitable opportunity arises, are consulted on and in place.

With regards to Gatwick, the number of night flights in the summer season has grown in recent seasons to a level that is very high in comparison with other airports which has resulted both in an increase in the people affected by noise at night and the level of complaints from communities around Gatwick about night flights. In the winter season on the other hand, there is currently significant unused capacity. The management of Gatwick Airport has also indicated that it is not seeking any increase to its current night flights allowances and the Government believes that given the current level of flights, and the fact that the number of people exposed to night noise has increased over the course of the current regime, there is no case for further increasing the movement limits.

[18] The quantified analysis in this IA assumes slightly different figures. We used the actual 2015/16 figure for the winter season, and, for the summer 2016 season we estimated the number of exempt movements using incomplete data before the season had finished.

Nevertheless, with airport capacity in the South East already under pressure, it is important that the economic benefits of making best use of existing capacity are not lost. For this reason, as for Heathrow, the Government believes it is appropriate to retain the current movement limits and that the regime from October 2017 should instead focus on encouraging the use of quieter aircraft at night which will benefit affected communities.

While we are considering an uplift in movements at Stansted, we are not proposing any uplifts to Heathrow and Gatwick's movement limits. While both of these airports also have some exempt aircraft currently in operation, since the number of current exempt aircraft does not represent a significant proportion of operations, as they do at Stansted, and both airports would currently be able to accommodate the current number of these within their existing movement limits (with the use of seasonal flexibility), there is no need to make such an adjustment.

5.6 Policy Option 4a – As Policy Option 3 and reduce noise quota limits at Heathrow and Gatwick

In addition to the approach in Option 3, this policy option would involve reducing the noise quota limits at Heathrow and Gatwick in each season to a level based on the current average noise quota usage per movement for the season[19], multiplied by the airport's movement limit for the season.

Under this policy option, we propose that the current average noise quota usage per movement would be determined using the final data for the winter 2015/16 and summer 2016 seasons. Based on the latest available data, we estimate that the new noise quota limits under this policy option would be as follows[20].

- 2,540 in the summer and 2,340 in the winter for Heathrow
- 4,870 in the summer and 1,655 in the winter for Gatwick

The proposed limits would ensure that if an airport wanted to maximise their movement limits, on average, the average noise quota usage per movement could not be any higher than today. This would help to lock in the benefits of aircraft becoming quieter at night that have already been delivered at these airports in recent years.

Stansted does not currently have much spare capacity in its noise quota limits. For example, the airport used approximately 100% of its noise quota in summer 2016 (see

Figure **6**). Given the significant differences in starting points, applying the same approach to all three airports would not be appropriate. We therefore do not propose to reduce the allowed noise quotas at Stansted under this policy option.

5.7 Policy Option 4b – As Policy Option 4a and further reduce noise quota limits gradually at all airports by 20% over the regime period.

This involves setting the noise quota limit according to option 4a, then reducing the quota gradually over the course of the regime. This should reduce, or at least maintain, the number of people affected by aircraft noise. For the purposes of our analysis in this stage of our consultation, we have used an illustrative reduction of 20% over the regime period (with a reduction of 5% of the 2017/18 value in

[19] Since movements by exempt aircraft do not currently count towards the movement limits at these airports, these movements were not included in these calculations.
[20] The quantified analysis in this IA assumes a slightly different figure for the summer season at Heathrow which was our estimate of this using incomplete data before the summer 2016 season had finished.

each year after 2017/18). This is an illustrative figure for the purposes of this analysis. We will take into account responses to the consultation and any relevant evidence that is submitted by stakeholders before deciding on the optimal, but realistic, reduction at each airport for this option that will achieve our environmental objective of both encouraging the use of quieter aircraft while maintaining the existing benefits of night flights. The final reductions will be determined by the individual situation at each airport and the level of reductions may therefore differ.

6 Costs and Benefits Overview

The Night Flights Evidence review, published by the Department for Transport, in Night Flying Restrictions at Heathrow, Gatwick and Stansted (2013) [21] analysed the types of costs and benefits that may be generated by night flights. These impacts include a mixture of costs and benefits as outlined below.

Costs:

- Noise
- Air quality
- Climate change

Economic benefits to:

- Airlines
- Airports
- Air transport users
- Public accounts
- Wider economic impacts

In addition, to aid our understanding of these impacts, the Department for Transport held focus groups in June 2016 with industry and community stakeholders. The papers issued for these events are published alongside our consultation and include a more recent discussion of the evidence base associated with these restrictions.

The available evidence on the costs and benefits of night flights is summarised in Section 6.1 and Section 6.2 below respectively. We have taken a proportionate approach to assessing the impacts of the policy options under consideration on these costs and benefits. At this stage of the assessment, sleep disturbance from noise is the only monetised impact.

We would welcome any further evidence that stakeholders can provide on the impacts of the policy options under consideration in responses to this consultation, and will take this on board in our final-stage IA. We have highlighted some areas where we would particularly welcome further evidence below but any evidence on the impacts of the policy options would be gratefully received.

It should be noted that where estimates are presented for a full year (e.g. 2017/18), seasons are aggregated as follows: 20XX/YY is the total for the 20XX/YY winter and the 20YY summer seasons (e.g. 2017/18 is the total for the winter 2017/18 and summer 2018 seasons).

[21] DfT (2013) 'Night Flight restrictions at Heathrow, Gatwick and Stansted: Stage 1 Consultation' https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/66837/consultation-document.pdf

6.1 Evidence on costs of night flights

This section summarises the available evidence on the costs of night flights. For all of these costs, it is expected that more flights would lead to an increase in these costs, and fewer flights would lead to a reduction in these costs. However, apart from the impact on sleep disturbance in the night quota period which has been monetised where possible, we have not quantified or monetised the other impacts of the policy options under consideration on these costs due to the limitations of the available evidence base and proportionality considerations.

6.1.1 Noise impacts

Although local communities are exposed to greater levels of aircraft noise during the day-time, night noise is of particular concern due to its interference with normal sleeping patterns. Furthermore, compared to other forms of traffic noise, aircraft noise is intermittent in nature, making it more likely to disturb sleep and elicit stress responses in the body.

There has been growing evidence that exposure to higher levels of aircraft noise can adversely affect people's health. In 2009, the World Health Organization (WHO) published their Night Noise Guidelines for Europe[22]. These state that between 40 to 55dB LAeq 8 hour[23], adverse health effects can be observed among the exposed population, and that above 55dB the situation is considered increasingly dangerous for public health, with frequently observed health effects and a sizable proportion of the exposed population highly annoyed and sleep-disturbed. The levels in the WHO guidelines do not refer solely to aviation, and are based on the level of outside noise from all sources – including other modes of transport. The WHO is expected to publish new guidelines for noise soon and it is possible these may include specific guidelines for different sources.

When the night flight restrictions were last reviewed in 2013, the Government acknowledged in its first stage consultation document that the monetisation of health impacts associated with aircraft noise at night represented an important evidence gap.

As a result of this evidence gap, the Department for Transport commissioned the Civil Aviation Authority (CAA) to undertake a literature review[24] regarding the effects of night time aircraft noise on local residents. The CAA's review, which was published alongside the stage one consultation document, concluded that chronic sleep disturbance as a result of these night flights is regarded as a health effect in its own right with a measurable impact on quality of life. We have monetised the impacts of night flights on sleep disturbance in the night quota period in this IA using the approach recommended by the CAA's review (see Section 7.3 for a full description of the methodology and key limitations of this analysis).

For impacts on cardiovascular health, the CAA's aforementioned review found evidence that night noise exposure above 55 dB LAeq, 8hr night results in increased risk of myocardial infarctions (heart attacks) and proposed an approach for monetising this. However, monetised estimates for this impact are not presented in this IA as it is not considered to be proportionate. Estimates generated by applying the CAA's methodology are negligible for all of the policy options under consideration, and

[22] World Health Organization (2009) 'Night Noise Guidelines for Europe' http://www.euro.who.int/__data/assets/pdf_file/0017/43316/E92845.pdf
[23] LAeq 8 hour: equivalent continuous noise level over the 8 hour night period.
[24] CAA (2013a) 'ERCD Report 1208: Aircraft Noise, Sleep Disturbance and Health Effects: A Review' http://publicapps.caa.co.uk/modalapplication.aspx?appid=11&mode=detail&id=5360

the Department's Transport Analysis Guidance[25] does not include the monetisation of the impact of night noise on the risk of myocardial infarctions.

There is evidence for a correlation between noise exposure from these flights and hypertension which can lead to an increased risk of stroke or dementia. This is said to be from long-term exposure to night noise, from people repeatedly experiencing the immediate stress responses of sleep disturbance[26]. All of these health impacts could have distributional impacts as they could be more likely to affect vulnerable members of society such as the elderly or those suffering from mental health issues.

For stress and mental health effects, the evidence is inconclusive or limited, showing a possible correlation for these flights between noise exposure and mental health symptoms (e.g. depression, anxiety) but not problems such as clinically defined psychiatric disorder.

For next day effects, there is some evidence to suggest that the night noise resulting from these flights has an effect on heart rate, subjective sleep quality and mood the next day, but there is no consistent scientific evidence of chronic objective effects on stress hormone levels, immune system or performance the next day.

In relation to the impact on children, the evidence on the impact of these flights is inconclusive. There is a growing amount of research that noise exposure from these flights has effects on cognitive development (particularly on reading) and chronic noise may affect children's stress levels, blood pressure and mental health. There is evidence to suggest that aircraft noise from these flights may be associated with poorer reading comprehension and recognition memory. However, it is unclear whether the effects are attributable to daytime or night time noise, and there is no evidence for long-term persistent effects on cognitive development.

The CAA have recently published a new paper, 'Aircraft noise and health effects: Recent findings'[27] which examines evidence on the relationship between aircraft noise and health that has been published since 2009. The report concludes that with regards to night noise and sleep disturbance, there is growing recognition that average indicators, such as L_{night}, are insufficient to fully predict sleep disturbance and sleep quality. This finding highlights the uncertainty around the monetisation of sleep disturbance from a change in the night flight restrictions. At this time, however, no alternative metrics exist that can be monetised. To supplement the monetised estimates, changes in the number of flights and quota usage are also presented with the assessment of the policy options.

Other recent evidence includes a review[28] by Dr Charlotte Clark from Queen Mary University of London, which was undertaken for the Airports Commission. This concluded that there is increasing evidence to support the use of prevention measures such as insulation, preventative policy,

[25] Department for Transport (2015) WebTAG: TAG unit A3 environmental impact appraisal, December 2015
https://www.gov.uk/government/publications/webtag-tag-unit-a3-environmental-impact-appraisal-december-2015
[26] 'Hypertension and Exposure to Noise near Airports (HYENA) Study' by Larup et al (2007)
& Babisch and van Kamp (2009)
[27] Civil Aviation Authority. Aircraft noise and health effects: Recent findings. March 2016
http://publicapps.caa.co.uk/docs/33/CAP%201278%20MAR16.pdf
[28] Dr Charlotte Clark (2015) 'Aircraft noise effects on health', Prepared for the Airports Commission
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/446311/noise-aircraft-noise-effects-on-health.pdf

guidelines, and limit values. The report highlighted the need to improve learning environments for children, and lower the prevalence of cardiovascular risk factors and cardiovascular disease.

In addition, the Aviation Environment Federation (AEF) has this year published a paper[29] which synthesised the latest evidence and analysed the Government's current policy with regards to aviation noise.

6.1.2 Air Quality

Aircraft fuel emissions from all flights, including night flights, cause a negative impact on air quality. This in turn can have negative impacts on human health, as well as on the natural and man-made environment. The key pollutants emitted by aircraft and affecting local air quality are particulate matter (PM10) and oxides of nitrogen (NOx). In general terms, the atmosphere is more stable at night which means that pollutants are dispersed less easily and thus air pollution emission at night can have a greater impact on local air quality. More flights would lead to a worsening of these impacts, and less flights would lead to a reduction of these impacts. But, if a reduction of night flights leads to an increase in the number of flights during the day, the impacts on air quality would be lesser compared to if the flight took place during the night. We have not attempted to quantify these impacts since it would not be proportionate as we expect these impacts to be minimal given the relatively small change in the overall number of flights at these airports.

6.1.3 Climate Change

Aviation's most significant contribution to climate change is through emissions of carbon dioxide (CO_2). The sector's share of the UK's overall greenhouse gas emissions has been increasing and is expected to rise further in the coming years. Night flights at Heathrow, Gatwick and Stansted contribute to greenhouse gas emissions. However, we have not attempted to quantify the impacts of the policy options under consideration on greenhouse gas emissions since it would not be proportionate as we expect these impacts to be minimal given the relatively small change in the overall number of flights at these airports.

6.2 Evidence on the benefits of Night Flights

This section summarises the available evidence on the benefits of night flights. For all of these benefits, it is expected that more flights would lead to an increase in these benefits whilst fewer flights would lead to a reduction in these benefits. Due to the limitations of the available evidence base, we have not quantified or monetised the impacts of the policy options under consideration on these benefits in this consultation-stage IA. However, the DfT has commissioned Systra to develop a flexible framework to monetise the economic benefits of night flights to airports, airlines, passengers and the public accounts, and we hope to use this methodology to monetise some of the impacts of the policy options under consideration on these benefits in our final-stage IA.

6.2.1 Airlines

Night flights have a direct impact on airlines profits from increased ticket sales and cargo revenue, as well as ancillary revenues such as charging for food and baggage. However, night flights also incur costs, which include capital costs of an aircraft, fuel, staffing and airport charges.

Night flights can allow low cost airlines, particularly at Gatwick and Stansted, to have a more flexible business model – allowing for further rotations and being able to absorb the impacts of any delays. In

[29] Aviation Environment Federation (AEF) (2016) 'Aircraft Noise and Public Health - The evidence is loud and clear', Commissioned by HACAN and the Aviation Environment Trust

2014/15, it is estimated that low cost airlines made up around 46% of Gatwick's movements in the night quota period and around 45% of Stansted's movements.[30]

Night flights can also be used for full service flights. This is evident at all three airports, but makes up a much higher proportion of Heathrow's flights (estimated to be around 99% in 2014/15). At Heathrow, it is estimated that around 95% of full service flights were arrivals.[31]

In 2014/15, in the night quota period, it is estimated that there were around 2,893 charter flights at Gatwick and around 803 at Stansted. Night flights represent an opportunity for charter airlines to increase their number of flights and utilisation of their aircraft.[32]

Finally, dedicated freight flights operate in the night quota period. It is estimated that there were around 2 at Gatwick, 8 at Heathrow and around 3,634 at Stansted in 2014/15. Where night flights are permitted, dedicated freight flights can support the express delivery business model. Stansted is an important freight hub and a base for several companies such as FedEX and TNT, for whom night flights are essential to their business. In the 14/15 season, it is estimated that around 35% of movements at Stansted were dedicated freight flights, compared to less than 1% at Heathrow and Gatwick.[33]

6.2.2 Airports

Night flights contribute to airports' profits through landing fee charges and also commercial revenues (for example, through shops and restaurants). They also incur costs which include the fixed costs of keeping the airport open as well as passenger and cargo handling costs.

6.2.3 Air Transport Users

Night flights can benefit air transport users (i.e. business and leisure passengers and air freight service users) in various ways, including by reducing costs to passengers via increasing supply. Passengers would also benefit from the increased flexibility in flight times, allowing them to fly when it is more convenient, which is particularly important for business passengers. For example, at Heathrow, early morning arrivals from the Far East allow business passengers to fly overnight to arrive in the UK for the business day, or to depart on an early morning connection into Continental Europe, despite the hour time difference.

6.2.4 Public Accounts

Night flights can affect the public account directly, by changing the tax receipts from taxes directly levied on aviation. It can also affect the public accounts indirectly, by altering indirect taxation receipts from goods consumed across the rest of the economy. If changes to aviation taxation are passed on as changes to air fares, this affects the amount of income leisure passengers have to spend on other goods and services in the economy, thereby affecting indirect revenues. In the leisure market the direct and indirect public account affects partially offset each other as an increase in aviation taxation leads to a fall in consumption of other taxable goods and services, and vice versa.

6.2.5 Wider Economic Impacts

Night flights have wider impacts on the UK economy. The nature of these impacts are not clear-cut and are a source of debate[34]. For example, Oxford Economics' (2011) identify a range of ways in which night flights benefit the wider economy including: opening up markets and fostering international

[30] DfT analysis of CAA Statistics, 2016
[31] DfT analysis of CAA Statistics, 2016
[32] DfT analysis of CAA Statistics, 2016
[33] DfT analysis of CAA Statistics, 2016
[34] See the various attempts to define the wider economic impacts of night flights in CE Delft (2011), 'Ban on night flights at Heathrow Airport, http://www.aef.org.uk/downloads/CEDelft_report_Heathrow_nightflights_Jan2011.pdf ; Oxford Economics (2011) 'The Economic Value of Night Flights at Heathrow', http://www.oxfordeconomics.com/my-oxford/projects/245739;

trade; encouraging investment in the UK by domestic and foreign investors; improving business efficiency and raising productivity; and spurring growth in the tourism economy.

Night flights also affect employment levels, both directly through changes in employment by airlines, airports and other companies operating at the airport, and indirectly via the impact on companies in the supply chain (e.g. aircraft parts/equipment by airlines) and the wider economy. Thus night flights are likely to increase employment. Night shifts are also likely to entail a wage premium, providing a further injection into the local economy, these incomes can be spent on consuming goods in nearby markets – which could generate growth around the airports.

In order to provide next-day and express delivery services, airlines need to operate at precise times during the night to fit in with complicated distributional networks. According to the Association of International Courier and Express Services (AICES), the express delivery sector contributed £2.3 billion to UK GDP and facilitated £116 billion to UK exports in 2010.[35] Firms pay a premium to use these services even though they could pay less for a slower delivery, demonstrating their preference for fast delivery. A report by the Aviation and Travel Consultancy found that around 40% of businesses would have to increase their inventories if next-day services were unavailable[36], which gives an idea of the scale of these efficiency savings to the UK economy as a whole. Higher profits for businesses, through cost savings and efficiency gains, can increase investment, a key driver of long-term productivity. However, these statistics consider the express delivery service sector as a whole, not just aviation, thus the direct impact that express delivery by air has on the economy would be lower.

Wider economic impacts are difficult to monetise due to the issues with identifying the impacts as a direct, or even indirect result of night flights. However, due to the evidence demonstrating their existence, we have categorised them to add context to our qualitative analysis.

6.2.6 Airline and Passenger Responses

We have identified a wide variety of potential passenger and airline responses to the policy options under consideration. This indicates that how passengers and airlines respond in practice would have an important influence on the impacts of the policy options under consideration on these benefits. For example, if a particular night flight no longer took place, passengers may reschedule to a later flight, fly to another UK airport, fly to another non-UK airport, or choose not to fly. We would welcome any evidence from stakeholders on the likely responses of airlines and passengers to the policy options under consideration.

7 Methodology

This section summarises the methodology used for the quantitative analysis of the impacts of the policy options that is presented in this IA.

Where quantitative analysis is presented for a policy option, this analysis has three key parts.

1. Estimating the number of night flights that would occur in the night quota period at each airport under the Do Nothing scenario and the policy option under consideration.
2. Estimating the number of people affected by night noise in the night quota period at each airport under the Do Nothing scenario and the policy option under consideration.
3. Estimating the value of the impact of night noise changes on sleep disturbance in the night quota period at each airport for the policy option under consideration compared to the Do Nothing scenario.

[35] Taken from consultation response to DfT from the Association of International Courier and Express Services (2016)
[36] 'The Economic Impact of Express Carriers for UK plc' by The Aviation and Travel Consultancy and Oxford Economic Forecasting, (June 2002)

Our analysis currently has a number of limitations, which means that the results of the quantitative analysis for all of the policy options under consideration that are presented in this IA are subject to considerable uncertainty. This means that there is uncertainty around both the impacts on the policy options and any comparisons that are made between the policy options in this IA.

Furthermore, quantitative analysis of the impacts of Option 3 and Option 4a at Stansted is not presented in this IA. This is because the limitations of our forecasts means that applying this methodology provides results that are not consistent with what we expect the direction of the impacts of these options to be (see Section 8.3.1 for a full explanation of the reasons for this). We hope to address this limitation in our final-stage IA.

7.1 Estimating the number of night flights

7.1.1 Summary

In order to estimate the number of night flights that would take place in the night quota period at each airport under the Do Nothing scenario and the policy option under consideration, the Department has developed a suite of new spreadsheet models. For each scenario, these spreadsheets estimate the following outputs for each year of the night flights regime split between the summer and winter seasons:

- the total number of movements in the night quota period at each airport;
- the total number of movements in the night quota period at each airport excluding any movements by aircraft with a QC of 0; and
- the total noise quota usage at each airport.

The key outputs for the Do Nothing scenario and the other policy options are presented in Appendix D of this IA.

In addition, these models can provide more disaggregated outputs. We have therefore used these models to estimate the total number of movements in the night quota period at each airport in the first and last years of the night for each aircraft type in the CAA's ANCON model. This information was provided to the CAA in order to estimate the number of people affected by night noise where relevant (see Section 7.2 for a full explanation of this).

7.1.2 Approach

The first stage of this analysis is to develop an unconstrained scenario for each airport. This scenario estimates what would happen in the night quota period at each airport in the absence of any night flight restrictions. At a high level, this has been undertaken as follows:

- The starting point for this analysis is CAA data on the number of night flights in the night quota period at each airport in the 2014/15 winter and 2015 summer seasons, including the type of aircraft and the quota count assigned to each movement;
- Assumptions about the future growth of night flights at each airport in each year of the next night flights regime in the absence of any night flight restrictions are then used to estimate the total number of movements in the night quota period in each year of the next night flights regime;
- DfT models the future fleet mix used for night flights at each airport in each year of the next night flights regime. This modelling is used to split the total number of movements in the night quota period in each year of the next night flights regime between aircraft types; and

- Finally, CAA data and assumptions on the average QC per movement for each aircraft type are used to estimate total QC in each year of the next night flights regime.

The second stage of this analysis is to model the policy scenario. The models allow us to model the movement and noise quota limits separately for each season, and to model the system of carryovers and overruns separately for movements and noise quota. However, given the complexity of the night flights regime, the models necessarily adopt a number of simplifying assumptions about industry behaviour. The key assumptions are as follows:

- Based on existing traffic patterns at each airport, we have assumed that Stansted and Gatwick will seek to maximise the total number of movements in the night quota period in the summer season and that Heathrow will seek to maximise the total number of movements in the night quota period in the winter season;
- Where it is necessary in order to maximise the number of movements in the above season, it has been assumed that the airport will use their option to carry over up to 10% of their movement limit and/or noise quota limit from the previous season, and their option to over-run their movement limit and/or noise quota limit in this season by up to 10%;
- Whilst the airports also have the option over-run their movement limit and/or noise quota limit in this season by up to 20%, we have used a simplifying assumption that industry will not use this due to the higher penalty that results from this (see Section 1.2); and
- Where the total number of movements and / or noise quota usage in any season would still be above the maximum allowed under the policy scenario even after carryovers and overruns are taken into account, we have adopted the simplifying assumption that the number of movements by each aircraft type will be reduced by an equal percentage until this is achieved.

It should be noted that the results of this analysis are very sensitive to these assumptions. We hope to test the extent to which these assumptions hold through consultation and would welcome any evidence that is submitted on this by consultees. This includes how airports would make use of the flexibility that allows them to carry-over unused movements from the previous season or overrun and borrow from the next season and which flights would be affected in situations when an airport hits either its movement or quota limit.

This input data used in this analysis and the key limitations of this data are described in more detail in the following sections.

7.1.3 CAA data and assumptions

A general limitation is that this analysis is based on the data provided to the DfT by the CAA on the 2014/15 winter and 2015 summer seasons, which was the latest data available at the time the models used for this analysis were developed. It is possible that this data may have small inaccuracies within it such as the wrong aircraft name, assigned quota value to that flight or age of the aircraft. In addition, no analysis has been conducted to determine if that year's data was typical in comparison to other year's data.

An example of the importance of this data is when determining the total noise quota usage at each airport in each year of the next night flights regime. This was completed separately for arrivals and departures in each season, with the approach used to assign a quota count to each aircraft type depending on whether the aircraft type was used for arrivals and / or departures in the 2014/15 winter and 2015 summer seasons.

- Where possible, we used the average quota count for that aircraft type in that specific season and split by arrivals and departures using CAA's data for the 2014/15 winter and 2015 summer

seasons (e.g. the average QC for an Airbus A319 at Heathrow in the winter season on arrival being 0.25);

- Where this information was not available for that specific category (e.g. an aircraft type was used in summer but not winter or at a different airport), then a standard set of QC assumptions were used based on the average QC across all three airports and both seasons but split between arrivals and departures; and
- Where an aircraft type was not used for any arrival or departures in the 2014/15 winter and 2015 summer seasons (e.g. new aircraft types such as the A320neo), we used assumptions from the CAA about the QC that would be assigned to these aircraft types. Where an aircraft has already been certified, it should be noted that the CAA's assumptions represent the highest QC that an aircraft could be (e.g. the A320neo is assumed to be QC/0.25 on departure). In addition, where new aircraft types have not been certified yet, it should be noted that the CAA's assumptions represent their worst-case estimates of the QC that could be assigned to these aircraft.

7.1.4 DfT modelling of the future fleet mix

This section provides more details of the DfT modelling of the future fleet mix used for night flights in the night quota period at each airport in each year of the next night flights regime. Forecasting changes in fleet mix is key to understanding what the future quota count at the airports is and has a significant impact on the results in this analysis.

Using winter 2014/15 and summer 2015 data supplied to us by the CAA on night flight movements described in Section 7.1.3, we have locally adapted the fleet mix model in our aviation modelling framework (see Appendix E for a summary of this) to forecast the future composition of night flights at each of the three airports.

The model estimates the proportions of night flights performed by each aircraft type for four carrier types (Scheduled, Chartered, Low cost carrier or Freighter) and six seat classes (c1: 0-70 seats, c2: 71-150 seats, c3: 151-250 seats, c4: 251-350, c5: 351–500 seats and c6:500+ seats). During the forecasting process for subsequent years, the model retires old aircraft and replaces them with new aircraft types.

The models use data on existing age of the aircraft and assumes default retirement ages of 22 for full service flights, 22 for low cost flights, 25 for charter flights and 30 for freighters (except when aircraft specific data is available). We split the data by airport, season and by arrivals/departures, resulting in a different model for each (for example, Heathrow Winter Arrivals). The models further split aircraft into seat band categories and service type (for example, 'Low cost seat class 3').

When an aircraft is retired, it is replaced by aircraft from the supply pool. Supply pools were reviewed and updated for this exercise. The model allows us to forecast fleet mix changes until 2028, including the introduction of new aircraft models in that period. Non-commercial aircraft were not forecast due to often incomplete data, nor were freighters at Heathrow and Gatwick since there were extremely low numbers at these airports; instead, the fleet mix for these movements was assumed to remain constant over time.

It is important to recognise that our fleet mix model is a national level model and so the underpinning assumptions in this model are not tailored to the individual airports. A particular limitation of this modelling is that it assumes that aircraft are flown until an assumed retirement age at which point they are replaced by new aircraft from the supply pool. This means that new aircraft types only enter the fleet when existing aircraft retire. However, in practice, given that night flights represent a small subsection of total flights, airlines could reallocate or rebase their aircraft to avoid certain aircraft flying in the night quota period and bring alternative aircraft into the night quota period. In addition, where demand for night flights is growing, airlines could purchase new aircraft types to cater for this

demand. As a result, for a given level of night flights, this analysis is likely to significantly underestimate the proportion of night flights in the night quota period that will be performed by new aircraft types such as the Airbus A320neo and the Boeing 737 Max.

The Airbus A320neo entered airline service in January 2016. We estimate that easyJet accounted for around 80% of all night-time Airbus A320 movements at Gatwick in 2014/15[37] and have also placed a firm order for 130 A320neos for delivery between 2017 and 2021/22. Based on current information available and assuming easyJet retire no current aircraft, that would result in more than a third of easyJet's fleet being comprised of the A320neo by 2021/22[38]. In contrast, our modelling estimates that the proportion of A320neos used at Gatwick during the next night flights regime is negligible.

The A320neo is currently certified as QC/0 on arrival and can be QC/0 or QC/0.25 on departure depending on the engine manufacturer. So, in our Do Nothing scenario, there could potentially be a large number of QC/0 movements by A320neos that are not being accounted for, particularly at Gatwick. Furthermore, a number of other new aircraft types are yet to be certified but could potentially also be certified as QC/0. Other things being equal, this could mean that our estimates of the Do Nothing scenario represent an underestimate of the night noise under a continuation of the current regime. We would welcome any evidence that stakeholders can provide through the consultation about how airlines that have ordered the A320neo and other new aircraft types such as the Boeing 737 Max plan on introducing these aircraft into their fleets.

It should also be noted that this is the first time that the DfT's fleet mix model has been applied to freighters. As a fleet, there are differences compared to passenger aircraft in terms of retirement ages and the range of planes, so it was a challenge to draw up the new supply pools to include in this model. Thus, these forecasts are not as robust as the forecasts for passenger aircraft. In particular, the results are very sensitive to the default retirement age of 30 years for freighters which has been assumed for the purposes of this analysis.

7.1.5 Assumptions about the future growth of night flights

There is significant uncertainty around what the future growth of night flights in the night quota period would be in the absence of any restrictions in future years. However, it is necessary to make assumptions about this in order to estimate the number of night flights that would take place under of the policy scenarios.

Since the Department's aviation model does not produce forecasts of night flights, we have consulted with Heathrow, Gatwick and Stansted and the latter two have provided growth forecasts on their forecast movements for the coming years[39]. Our IA therefore assumes that the number of night flights in the night quota period would grow over time in line with forecasts provided to us by Gatwick and Stansted in the absence of any night flight restrictions. In addition, Heathrow is operating at virtually the maximum capacity permitted under the Terminal 5 planning conditions (480,000 movements per year), and it was agreed with Heathrow that it was reasonable to assume that there would be no growth in the night quota period in future years for the purposes of this IA.

It should be noted that Gatwick and Stansted's night flights forecasts are higher than the overall growth estimated by the DfT Aviation Model for these airports. Where the actual growth in night flights differs in practice from the assumptions we have made for the purposes of this IA, this could potentially significantly alter the impacts of the policy options that have been estimated in this IA. In particular, if our assumptions overestimate the growth in night flights, this could reduce the impacts

[37] DfT analysis of CAA Statistics, 2016
[38] CAA Data
[39] ICF. Night Jet Movement Consultation Support, Commissioned by Gatwick Airport Limited. 2016

of the policy options that have been estimated; whereas, if our assumptions underestimate the growth in night flights, this could increase the impacts of the policy options that have been estimated.

7.2 Estimating the number of people affected by night noise

All estimates of the number of people affected by night noise in the night quota period at each airport under the Do Nothing scenario and the other policy options presented in this IA were produced by the Civil Aviation Authority (CAA). This was done by calculating noise contours using the UK Civil Aircraft Noise Contour model ANCON (version 2.3), which is developed and maintained by the CAA on behalf of the Department. ANCON is fully compliant with the latest international guidance on noise modelling from ECAC (ECAC.CEAC Doc 29 (3rd edition), published in December 2005)[40] and ICAO (ICAO Doc. 9911, published 2008)[41]. These guidance documents represent internationally agreed best practice as implemented in modern aircraft noise models. However, since DfT's analysis was used as an input to this, the results are also subject to the limitations described previously.

7.3 Estimating the value of the impact of the change in night noise on sleep disturbance

Where monetary estimates of the impact of the change in night noise on sleep disturbance in the night quota period are presented in this IA, we have calculated these estimates using the latest environmental guidance published by the Department's Transport Analysis Guidance (TAG) unit. This guidance reflects the latest Defra guidance on the valuation of transport-related noise. This uses noise contour and population estimate results to consider the costs associated with Sleep Disturbance. The TAG methodology on sleep disturbance is consistent with the methodology developed previously by the CAA on behalf of the Department and reported in ERCD Report 1209.

For sleep disturbance, the TAG methodology uses WHO-recommended relationships for estimating the number of people said to be Highly Sleep Disturbed (HSD), based on studies of self-reported sleep disturbance. These are based on 8 hour L_{night} (2300-0700) noise exposure. A limitation of our analysis is that we have used data for the LAeq, 6.5 hour night period in place of data on the 8 hour L_{night} period to implement this methodology. As explained in ERCD Report 1209, arguments can be put forward that the dose-response function for the LAeq, 6.5 hour night period will be different to the 8 hour L_{night} period. On balance however, and in the absence of data to the contrary, the ERCD report concluded there was no strong evidence to alter the dose-response functions and that data on the LAeq, 6.5 hour night period could be substituted for 8 hour L_{night} data as required without further adjustment. We have therefore adopted this approach in this IA. However, to the extent that there are any differences in the dose-response functions between the LAeq, 6.5 hour night and periods in practice, this would introduce uncertainty surrounding the results of this analysis.

An alternative to using LAeq, 6.5 hour night exposure results would have been to model future changes in noise exposure over the 8 hour L_{night} caused by forecast changes in night restrictions that apply to the LAeq, 6.5 hour night period. Such an approach would require assessment of the possible displacement of flights from the 6.5 hour night quota period (NQP) into the shoulder hours. However, because there are approximately three to four times as many flights in the shoulder hours compared to the NQP, any changes during the NQP will be averaged over the full 8 hour night. In addition, because the daytime period is capacity constrained at both Heathrow and Gatwick, the extent to which flights could be displaced into the shoulder periods would be subject to greater uncertainty than using the LAeq, 6.5 hour night noise exposure results directly. Thus we have used the LAeq, 6.5 hour night approach, but any monetised noise estimates in this impact assessment could be

[40] European Civil Aviation Conference. Report on Standard Method of Computing Noise Contours around Civil Airports ECAC.CEAC Doc 29, 3rd edition, Volumes 1 & 2, December 2005

[41] International Civil Aviation Organization (ICAO): Recommended Method for Computing Noise Contours Around Airports. ICAO Doc 9911, 1st Edition (2008)

considered to be an underestimate of the actual impact since, typically, a LAeq, 6.5 hour night level is slightly lower than an 8 hour L_{night} level at a given location around an airport[42].

Given the size of the expected impacts for these policy scenarios, to keep the analysis proportionate, the detailed noise impact analysis described in Section 7.2 has only been undertaken using the ANCON model for the first and the last years of the regime, 2017/18 and 2021/22. For these years, we have used the results of the ANCON modelling directly to estimate the monetary value of the impact of the change in night noise on sleep disturbance.

For other years, we have adopted a simplified approach and interpolated the monetary value of the impact of the change in night noise on sleep disturbance using the 2017/18 and 2021/22 results. In order to do this, the key simplifying assumption that was made is that the monetary value of the impact of the change in night noise on sleep disturbance is linearly related to the change in the total noise quota usage under the policy option compared to the Do Nothing scenario[43]. We have ensured that, for each airport, our simplified approach would replicate all of the estimates for 2017/18 and 2021/22 that are presented in this IA[44]; and would result in an estimate of £0 under a scenario where there is no change in noise quota usage. However, it should be noted that the use of this simplifying assumption results in these estimates being subject to additional uncertainty.

No analysis has been undertaken on any impacts on noise outside the night quota period. The impact of a reduction in night flights in the night quota period depends on whether flights are rescheduled or cancelled. Plus, if rescheduled, the time to which a flight is moved would change the impact. It is not possible at this time to predict the time to which a flight is rescheduled or if it would be cancelled using our available evidence base at this time. We would welcome any evidence that stakeholders can provide on this issue in responses to the consultation.

8 Costs and Benefits of Each Policy Option

8.1 Policy Option 1 - Do Nothing scenario

This section provides a brief overview of our analysis for the Do Nothing scenario. Further results for this scenario are presented in Appendix D.

A particular limitation of our analysis is that we expect that our estimates are significantly under-estimating the number of movements in the night quota period by QC/0 aircraft at Stansted and to a lesser extent at Heathrow and Gatwick under the Do Nothing scenario. The reasons for this are as follows:

- The fleet mix modelling of freighters at Stansted suggests that there would be a significant decline in the number of QC/0 movements by freighters. This result appears counterintuitive given that the number of night flights at Stansted (excluding those by QC/0 aircraft) would be constrained by the night flights regime, and arises purely as a result of the lifetime of freighters that has been assumed, which is subject to considerable uncertainty.

- Our analysis, which is based on data for 2014/15, is significantly under-estimating the actual growth in movements by QC/0 aircraft at Stansted between 2014/15 and 2015/16.

[42] In addition, these estimates do not cover flights that would be granted dispensations (see Section 1.1 for more details on such flights).
[43] Given that there are changes to the quota count system under the policy options, the total noise quota usage for the Do Nothing scenario has been recalculated to reflect these changes. Therefore, the change in noise quota usage under the policy option is being calculated on a consistent basis.
[44] This means that, for example, if the change in the total noise quota usage under Policy Option 2 in 2019/20 was estimated to be the same as the change in the total noise quota usage under Policy Option 4 in 2017/18, the estimate produced by our simplified approach for Policy Option 2 would be the same as the estimate produced directly using the results of the ANCON model for Policy Option 4.

- Due to the limitations of our fleet mix modelling, our analysis is also likely to significantly underestimate the take up of next generation QC/0 aircraft at all airports (see Section 7.1.4 for more details).

- For new aircraft types, the QC categorisation we have assumed is intended to represent the highest QC ratings that could be assigned to these aircraft (see Section 7.1.3 for more details), which is likely to further under-estimate the number of movements by next generation QC/0 aircraft.

- Finally, the simplifying assumptions in our analysis lead to the growth in QC/0 movements being under-estimated under our Do Nothing scenario in situations when the number of night flights at an airport (excluding those by QC/0 aircraft) would be constrained by the movement or noise quota limits[45].

Holding all other assumptions constant, we expect that this limitation means that our analysis is likely to significantly under-estimate the impacts of a policy option on the number of night flights in the night quota period at Stansted and to a lesser extent at Gatwick under some scenarios (such as in the case of Policy Option 3). But, in other circumstances, it is possible that this limitation could also lead to the analysis over-estimating the impacts of a policy option on the number of night flights in the night quota period (such as where the noise quota limit is constraining movements at an airport under a policy option but not the Do Nothing scenario). Consequently, this is a key cause of the uncertainty surrounding the costs and benefits that are estimated in this IA. However, it is expected that the analysis for Heathrow would be unaffected given the assumption of no growth.

8.1.1 Gatwick: Do Nothing scenario

During the 5 years of the next night flights regime, it is estimated that the number of night flights in the night quota period at Gatwick (excluding those by QC/0 aircraft) would be constrained by the movement limits in every season except for the 2017/18 winter season; and that there would be a significant amount of unused noise quota in each season. It is estimated that Gatwick would carry-over 10% of its movement limit from the winter season to the summer season and over-run its movement limit in the summer season by 10% in all 5 years.

8.1.2 Heathrow: Do Nothing Scenario

During the 5 years of the next night flights regime, it is estimated that the number of night flights in the night quota period at Heathrow (excluding those by QC/0 aircraft) would not be constrained by the movement limits in any season and that there would be a significant amount of unused noise quota in each season. It is estimated that Heathrow would carry-over between around 2% and 4% of its movement limit from the summer season to the winter season in each year.

8.1.3 Stansted: Do Nothing scenario

During the 5 years of the next night flights regime, it is estimated that the number of night flights in the night quota period at Stansted (excluding those by QC/0 aircraft) would be constrained by the movement limits in the summer season from 2019 and in the winter season from 2020/21. The

[45] This is because the simplifying assumptions in our analysis mean that the growth in QC/0 movements is reduced in situations when the number of night flights at an airport (excluding those by QC/0 aircraft) would be constrained by the movement or noise quota limits, but in reality, the growth in QC/0 movements would be unaffected under the Do Nothing scenario.

number of flights in the night quota period would also be constrained by the quota limit in the 2017/18, 2018/19 and 2019/20 winter seasons. It is estimated that Stansted would carry-over 10% of its movement limit and between around 7% and 10% of its quota limit from the winter season to the summer season in each year. We also estimate Stansted will over-run its movement limit in the summer season by between around 7% and 10% in each year and over-run its quota limit in the summer season in some years by between around 2% and 5%.

8.1.4 Estimated number of people affected by night noise

CAA noise analysis identifies the 48dB LAeq, 6.5hr night contour as the region at which night noise could have adverse health effects on populations.[46] It is proposed that this contour is used to measure progress against the proposed environmental objective. The estimated populations within this contour in the 6.5 hour night quota period at all three airports in the first and last years of the next night flights regime under the Do Nothing scenario can be found in Figure 8 below.

Figure 8 – Number of people affected at Heathrow, Gatwick and Stansted[47]

Summary of populations within 48 dBA LAeq, 6.5 hour night

	Year	Heathrow*	Gatwick	Stansted
Policy Scenario: Do Nothing	**2017-18**	91,250	4,500	4,250
	2021-22	80,550	4,550	4,100

***** The decision to announce the north-west runway at Heathrow as the Government's preferred scheme for delivering new runway capacity does not change these figures, since any extra capacity would be delivered after 2022.

8.2 Policy Option 2

8.2.1 Impact of Option 2 on the number of night flights

It is estimated that there would be around 750 fewer night flights in the night quota period in total at Gatwick under Policy Option 2 compared to the Do Nothing scenario across the 5 year regime. This is due to both existing QC/0 movements and the increasing number of QC/0 aircraft expected in the future.

It is estimated that there would be no change in the number of night flights in the night quota period at Heathrow under Policy Option 2 compared to the Do Nothing scenario. This is because: Heathrow's flights mainly consist of full service flights, with few QC/0 movements; there is spare capacity within the movement limits; and Heathrow is assumed not to grow over the forecast period.

It is estimated that there would be around 5,860 fewer night flights in the night quota period at Stansted in total under Policy Option 2 compared to the Do Nothing scenario across the 5 year regime. The estimated impact on the number of night flights at Stansted is larger than at Gatwick because of the number of movements by QC/0 aircraft at Stansted.

Appendix D provides full details of our estimates of the total number of night flights and total quota count each year.

[46] K. Jones, Environmental Research and consultancy Department, CAA. Aircraft Noise and Sleep Disturbance: A Review (2009) https://publicapps.caa.co.uk/docs/33/ERCD0905.pdf
[47] CAA Data

8.2.2 Costs of Option 2

Compared to the Do Nothing scenario, it is expected that the estimated reduction in the number of night flights in the night quota period at Gatwick and Stansted under Policy Option 2 would result in a number of costs to businesses, passengers and the Government.

The direct costs to business would be felt by airlines and airports, particularly the impacts on their profitability from a reduction in the number of night flights in the night quota period. There would also be a range of indirect costs to other businesses, including the knock on impacts this would have on business passengers, the air freight sector and the wider economy.

In addition, it is also expected that leisure passengers would be affected by a reduction in the consumer benefits of night flights in the night quota period, and that the Government would experience a reduction in the tax revenues from night flights in the night quota period, principally from APD.

For the reasons outlined in Section 6.2, these costs are not monetised in this consultation-stage IA.

Furthermore, stakeholders will also face costs when familiarising themselves with the updated regulations, regardless of the policy option selected. Given the longstanding nature of the night flights restrictions, we expect the time required for familiarisation will be limited. We would welcome views through the consultation on the time required for stakeholders, largely airports, airlines and communities, to read and understand the updated regulation.

As it is estimated that there would be no change in the number of night flights in the night quota period at Heathrow under Policy Option 2 compared to the Do Nothing scenario, no costs are expected at Heathrow.

8.2.3 Benefits of Option 2

Compared to the Do Nothing scenario, the key benefits of Policy Option 2 are the reduced night noise that would be experienced by local residents that live near Gatwick and Stansted airports in the night quota period. This is a result of the estimated reduction in the number of night flights in the night quota period at these airports.

At Gatwick, compared to the Do Nothing scenario, it is estimated that:

- In 2017/18, the reduction in the number of flights in the night quota period would lead to no change in the number of people affected in the 48dB LAeq, 6.5hr night contour (around 4,500) and a reduction in the size of the contour area by around 0.2 sq km (around 37.7 sq km compared with around 37.9 sq km);
- In 2021/22, the reduction in the number of flights in the night quota period would lead to around 50 fewer people affected in the 48dB LAeq, 6.5hr night contour (around 4,500 compared to around 4,550), and a reduction in the size of the contour area by around 0.7 sq km (around 37.3 sq km compared with around 38.0 sq km).

At Stansted, compared to the Do Nothing scenario, it is estimated that:

- In 2017/18, the reduction in the number of flights in the night quota period would lead to around 150 fewer people affected in the 48dB LAeq, 6.5hr night contour (around 4,100 compared to around 4,250), and a reduction in the size of the contour area by around 2.9 sq km (around 35.4 sq km compared with around 38.2 sq km);
- In 2021/22, the reduction in the number of flights in the night quota period would lead to around 100 fewer people affected in the 48dB LAeq, 6.5hr night contour (around 4,000

compared to around 4,100), and a reduction in the size of the contour area by around 2.2 sq km (around 33.3 sq km compared with around 35.5 sq km).

Estimates of the value of the reduction in sleep disturbance from night flights in the night quota period at Gatwick and Stansted under Policy Option 2 compared to the Do Nothing scenario are presented in Figure 9 and Figure 10 below. These show that the total value of these benefits over the 5 year regime are estimated at around £14,460 at Gatwick and around £254,750 at Stansted (in present value terms and constant prices[48])[49].[50]

Figure 9 - Value of the reduction in sleep disturbance from night flights at Gatwick (Policy Option 2 Vs Do Nothing) (Present Value) (Constant prices)[51]

	2017/18	2018/19	2019/20	2020/21	2021/22
Sleep disturbance (£)	2,270	2,750	2,760	3,080	3,600

Figure 10 - Value of the reduction in sleep disturbance from night flights at Stansted (Policy Option 2 Vs Do Nothing) (Present Value) (Constant prices)[52]

	2017/18	2018/19	2019/20	2020/21	2021/22
Sleep disturbance (£)	59,770	69,350	65,040	30,530	30,050

There are also expected to be a number of other benefits from the reduction in night flights in the night quota period at Gatwick and Stansted, including a reduction in the other costs of night noise, improved quality and reduced greenhouse gas emissions. For the reasons outlined in Section 6.1, these benefits are not monetised in this consultation-stage IA.

More generally, introducing a new QC category and counting all movements towards the limit will increase the transparency of the regime and provide more certainty for communities on the number of flights that can take place in the night quota period at these airports. This benefit applies at all three airports.

8.3 Policy Option 3

8.3.1 Impact of Option 3 on the number of night flights

Based on the latest evidence (including the significant growth in the number of movements by QC/0 aircraft between 2014/15 and 2015/16), it is expected that the number of night flights in the night quota period at Stansted under Policy Option 3 would decrease compared to the Do Nothing scenario, but that the decrease under Policy Option 3 would be lower than under Policy Option 2. However,

[48] The Present Value Base Year is 2015 and the Price Base Year is 2015.
[49] Figures may not sum due to rounding
[50] This IA assesses options for the night flights regime that will apply from October 2017. Each year of the regime (comprising a winter season and the following summer season) therefore covers two calendar years. As a simplifying assumption, our monetised analysis values the impacts in each year of the regime as though they occurred in the first of these calendar years (e.g. the impacts in 2017/18 are valued as though they occurred in 2017). Holding all other assumptions constant, this simplifying assumption is expected to result in our estimates slightly overestimating the value of these impacts when they are expressed in present value terms.
[51] The Present Value Base Year is 2015 and the Price Base Year is 2015.
[52] The Present Value Base Year is 2015 and the Price Base Year is 2015.

quantitative analysis of the impacts of Policy Option 3 at Stansted is not presented in this IA. The reasons for this are as follows.

- We expect that our forecasts are significantly under-estimating the number of movements in the night quota period by QC/0 aircraft at Stansted under to the Do Nothing scenario (see Section 8.1 for more details).
- As a consequence, the estimates from applying our methodology suggest that the number of night flights in the night quota period at Stansted across the 5 year regime would increase under Policy Option 3 compared to the Do Nothing scenario.
- Since this result is not consistent with the expected direction of the impacts of Policy Option 3 on the number of night flights in the night quota period at Stansted described above, it is not felt appropriate to include quantitative analysis for Policy Option 3 in this IA.

Policy option 3 is the same as Policy Option 2 for Heathrow and Gatwick. Therefore, the reduction in the number of night flights in the night quota period at Gatwick is expected to be the same as under Policy Option 2 and it is expected that there would be no change in the number of night flights in the night quota period at Heathrow.

8.3.2 Costs of Option 3

As it is expected that the number of night flights in the night quota period at Stansted under Policy Option 3 would decrease compared to the Do Nothing scenario, but that the decrease under Policy Option 3 would be lower than under Policy Option 2, it is expected that the costs described in Section 8.2.2 would be lower at Stansted under Policy Option 3 than under Policy Option 2.

Policy Option 3 is the same as Policy Option 2 for Heathrow and Gatwick. Therefore, the costs at Gatwick are expected to be the same as under Policy Option 2 and it is expected that there would be no costs at Heathrow.

8.3.3 Benefits of Option 3

As it is expected that the number of night flights in the night quota period at Stansted under Policy Option 3 would decrease compared to the Do Nothing scenario, but that the decrease under Policy Option 3 would be lower than under Policy Option 2, it is expected that the benefits described in Section 8.2.3 would be lower at Stansted under Policy Option 3 than under Policy Option 2.

Policy Option 3 is the same as Policy Option 2 for Heathrow and Gatwick. The benefits at Heathrow and Gatwick are therefore expected to be the same as under Policy Option 2.

8.4 Policy Option 4a

8.4.1 Impact of Option 4a on the number of night flights

The number of night flights in the night quota period at Gatwick and Heathrow under Policy Option 4a is estimated to be the same as under Policy Option 2. This is because it is estimated that there would be a significant amount of unused noise quota at Heathrow and Gatwick under the Do Nothing scenario, and so the proposed reductions in the noise quota at Heathrow and Gatwick are estimated to have no further impact on the number of movements in the night quota period at Heathrow and Gatwick compared to the Do Nothing scenario than Policy Option 2. Appendix D provides full details of our estimates of the total number of night flights in the night quota period and total quota count at Heathrow and Gatwick each year under Policy Option 4a.

Policy Option 4a is the same as Policy Option 3 for Stansted. Therefore, the reduction in the number of night flights in the night quota period at Stansted under Policy Option 4a is expected to be the same as under Policy Option 3.

8.4.2 Costs of Option 4a

The number of night flights in the night quota period at Heathrow and Gatwick under Policy Option 4a are estimated to be the same as under Policy Option 2. Therefore, the costs at Gatwick are expected to be the same as under Policy Option 2 and it is expected that there would be no costs at Heathrow.

Policy Option 4a is the same as Policy Option 3 for Stansted. The costs at Stansted are therefore expected to be the same as under Policy Option 3.

8.4.3 Benefits of Option 4a

The number of night flights in the night quota period at Heathrow and Gatwick under Policy Option 4a are estimated to be the same as under Policy Option 2. Therefore, the benefits at Heathrow and Gatwick under Policy Option 2 would also apply under Policy Option 4a. Furthermore, although reducing the noise quota limits at Heathrow and Gatwick is not expected to have any impact on the number of night flights in the night quota period at these airports, it would help to lock in the benefits of quieter aircraft that have been seen over recent years. Compared to the Do Nothing scenario, this would provide more certainty on the scale of the potential noise impacts that could be experienced by local residents at these airports.

Policy Option 4a is the same as Policy Option 3 for Stansted. The benefits at Stansted are therefore expected to be the same as under Policy Option 3.

8.5 Policy Option 4b

8.5.1 Impact of Option 4b on the number of night flights

Compared to the Do Nothing scenario, it is estimated that in total there would be around 5380 fewer night flights in the night quota period at Gatwick and around 5490 fewer night flights in the night quota period at Stansted under Policy Option 4b compared to the Do Nothing scenario across the 5 year regime.

However, it is estimated that there would be no reduction in the number of night flights in the night quota period at Heathrow under Policy Option 4b compared to the Do Nothing scenario. This is because it is estimated that there would be a significant amount of unused noise quota at Heathrow under the Do Nothing scenario, and so the proposed reductions in the noise quota at Heathrow are estimated to have no impact on the number of movements in the night quota period.

Appendix D provides full details of our estimates of the total number of night flights in the night quota period and total quota count each year under Policy Option 4b.

8.5.2 Costs of Option 4b

As the estimated reduction in the number of night flights in the night quota period at Gatwick under Policy Option 4b is higher than under Policy Option 2, these estimates imply that the costs described in Section 8.2.2 would be higher at Gatwick under Policy Option 4b than under Policy Option 2.

As the estimated reduction in the number of night flights in the night quota period at Stansted under Policy Option 4b is similar to that under Policy Option 2, these estimates imply that the costs described in Section 8.2.2 would be similar at Stansted under Policy Option 4b and Policy Option 2.

As it is estimated that there would be no change in the number of night flights in the night quota period at Heathrow under Policy Option 4b compared to the Do Nothing scenario, no costs are expected at Heathrow.

8.5.3 Benefits of Option 4b

Compared to the Do Nothing scenario, the key benefit of Policy Option 4b is the reduced night noise in the night quota period that would be experienced by local residents that live near Gatwick and Stansted airports. This is a result of the estimated reduction in the number of night flights in the night quota period at these airports.

At Gatwick, compared to the Do Nothing scenario, it is estimated that:

- In 2017/18, the reduction in the number of flights in the night quota period would lead to no change in the number of people affected in the 48dB LAeq, 6.5hr night contour (around 4,500) and a reduction in the size of the contour area by around 0.2 sq km (around 37.7 sq km compared with around 37.9 sq km);
- In 2021/22, the reduction in the number of flights in the night quota period would lead to around 600 fewer people affected in the 48dB LAeq, 6.5hr night contour (around 3,950 compared to around 4,550) and a reduction in the size of the contour area by around 6.9 sq km (around 31.1 sq km compared with around 38.0 sq km).

At Stansted, compared to the Do Nothing scenario, it is estimated that:

- In 2017/18, the reduction in the number of flights in the night quota period would lead to around 50 fewer people affected in the 48dB LAeq, 6.5hr night contour (around 4,200 compared to around 4,250), and a reduction in the size of the contour area by around 0.3 sq km (around 37.9 sq km compared with around 38.2 sq km);
- In 2021/22, the reduction in the number of flights in the night quota period would lead to around 350 fewer people affected in the 48dB LAeq, 6.5hr night contour (around 3,750 compared to around 4,100), and a reduction in the size of the contour area by around 5.0 sq km (around 30.5 sq km compared with around 35.5 sq km).

Estimates of the value of the reduction in sleep disturbance from night flights in the night quota period at Gatwick and Stansted under Policy Option 4b compared to the Do Nothing scenario are presented in Figure 11 and Figure 12 below. These show that the total value of these benefits over the 5 year regime are estimated at around £151,640 at Gatwick and around £243,580 at Stansted (in present value terms and constant prices [53])[54].

[53] The Present Value Base Year is 2015 and the Price Base Year is 2015.
[54] Figures may not sum due to rounding

Figure 11 - Value of the reduction in sleep disturbance from night flights at Gatwick (Policy Option 4b Vs Do Nothing) (Present Value) (Constant prices)[55]

	2017/18	2018/19	2019/20	2020/21	2021/22
Sleep disturbance (£)	2,270	3,920	22,550	48,270	74,640

Figure 12 - Value of the reduction in sleep disturbance from night flights at Stansted (Policy Option 4b Vs Do Nothing) (Present Value) (Constant prices)[56]

	2017/18	2018/19	2019/20	2020/21	2021/22
Sleep disturbance (£)	12,270	27,780	62,330	62,690	78,510

As the estimated reduction in the number of night flights in the night quota period at Gatwick under Policy Option 4b is higher than under Policy Option 2, these estimates imply that the non-monetised benefits described in Section 8.2.3 would be higher at Gatwick under Policy Option 4b than under Policy Option 2.

As the estimated reduction in the number of night flights in the night quota period at Stansted under Policy Option 4b is similar to that under Policy Option 2, these estimates imply that the benefits described in Section 8.2.3 would be similar at Stansted under Policy Option 4b and Policy Option 2.

The number of night flights in the night quota period at Heathrow is estimated to be the same as under Policy Option 2. The benefits at Heathrow under Policy Option 2 would also apply under Policy Option 4b. Furthermore, although reducing the noise quota limits at Heathrow is not expected to have any impact on the number of night flights in the night quota period at Heathrow, it would help to lock in the benefits of quieter aircraft that have been seen over recent years. Compared to the Do Nothing scenario, this reduces the uncertainty surrounding the scale of the potential noise impacts that could be experienced by local residents. Since the reduction in noise quota limits is higher under Policy Option 4b than Policy Option 4a, this benefit would be higher under Policy Option 4b than Policy Option 4a.

9 Rationale and evidence that justify the level of analysis used in the IA (proportionality approach)

Quantitative analysis of the impacts of Policy Option 3 and Policy Option 4a at Stansted is not presented in this IA because of the limitations of our forecasts which mean that applying our methodology provides results that are not consistent with what we expect the direction of the impacts of these options to be (see Section 8.3.1).

Although these estimates are subject to considerable uncertainty (see Section 7.1 and Section 8.1, for example), DfT's estimates of the change in the number of night flights in the night quota period that are presented in this IA make use of the best evidence available at the time of developing the models.

The estimates of the change in the level of night noise experienced by local residents in the night quota period presented in this IA have been produced using the ANCON model, which is fully

[55] The Present Value Base Year is 2015 and the Price Base Year is 2015.
[56] The Present Value Base Year is 2015 and the Price Base Year is 2015.

compliant with internationally agreed best practice (see Section 7.2). However, since DfT's analysis was used as an input to this, the results are also subject to the limitations described previously.

The estimates of the value of the impact of the change in night noise in the night quota period on sleep disturbance presented in this IA were estimated using the results of the ANCON model for the first and last years of the regime. However, given the scale of the expected impacts and the resources required to run the ANCON model, estimates for the intervening years were calculated using a simplified approach on proportionality grounds (see Section 7.3).

It was not possible to monetise any of the impacts on businesses, passengers and the Government in this consultation-stage IA due to the limitations of the available evidence at the time this consultation-stage IA was finalised (see Section 6.2). Although the Government has commissioned research to improve our evidence base in this area, it has been necessary to finalise this IA in advance of this research being completed in order to meet the required timetable for this consultation.

Finally, the impacts on air quality and greenhouse gas emissions have not been monetised on proportionality grounds given the relatively small change in the overall number of flights at these airports. In addition, due to the inconclusive and/or limited evidence, we have not quantified or monetised other noise impacts or wider economic impacts (see Section 6.1 and Section 6.2).

10 Direct costs and benefits to business calculations (following BIT methodology)

Since the night flights restrictions at Gatwick, Heathrow and Stansted are domestic rules that regulate business, the Government considers that this measure is in scope of the One-In, Three-Out (OITO) rule and is a qualifying provision for the purposes of the Business Impact Target (BIT).

Given the nature of the changes to the night flights restrictions that are being considered, the Government considers that this measure will directly impact on both airlines and airports[57]. Therefore, this measure will need to be scored for the purposes of the BIT on the basis of the estimated Equivalent Annual Net Direct Cost to Business (EANDCB)[58] for airlines and airports.

It is not possible to estimate the EANDCB for airlines and airports at this time. This is because it has not been possible to monetise any of the impacts of the policy options on business in this consultation-stage IA due to the limitations of the available evidence base (see Section 6.2). However, the Government has commissioned research to improve our evidence base in this area and plans to undertake proportionate analysis to monetise the impacts on business and the EANDCB in the final-stage IA where this is feasible. We would welcome any evidence that stakeholders can provide to help us to monetise the impacts of the policy options on business.

11 Wider impacts

The wider social, environmental and economic impacts of the proposed policy options not already discussed within this IA have been considered, together with possible unintended consequences. Where we have identified potential impacts, they are described in the following paragraphs.

At the current stage of the assessment it has not been possible to analyse the economic and wider impacts of changes to the night flight regime. Any change in the number of night flights will have economic impacts on airlines, the airports, competitors, passengers, freight businesses and the wider

[57] The Government considers that all other impacts on business are indirect (see Section 8.2.2).
[58] As night flight restrictions are currently in place, the EANDCB should measure the change in the net average direct costs to these businesses under the final policy option compared to the Do Nothing scenario.

economy. We would welcome any evidence that stakeholders can provide on these issues. The below provides a summary of the potential impacts.

11.1 Competition assessment

It is estimated that the policy options under consideration in this IA would alter the number of night flights in the night quota period at Gatwick and Stansted airports during the next night flights regime compared to the Do Nothing scenario, but would have no impact on the number of night flights in the night quota period at Heathrow. This illustrates the potential for these policy options to impact on competition.

The significance of any impacts on competition in practice will depend on the magnitude of the change in the number of night flights at these airports under our final policy option compared to the Do Nothing scenario and is therefore subject to the significant uncertainty surrounding our analysis.

Given the limitations of our available evidence base on this issue at present, we would welcome any evidence that consultees can provide on any of the potential impacts of the policy options on competition. To facilitate this, the potential impacts on competition that we have identified are discussed in more detail below.

- Where a policy option reduces (increases) the number of night flights that can take place at one of these airports, it is possible that this may reduce (increase) the competitiveness of the airport compared to competing airports that serve the same markets (which could be in the UK or overseas), and could, for example, impact on the airport that airlines choose to base their aircraft at.
- It may also have broader impacts on the competitiveness of airlines that operate night flights at these airports compared to competitors that operate night flights at other airports (which again could be in the UK or overseas); or on the competition within the markets for night flights between UK and some destinations (such as if this reduces or increases the number of night flights to / from a given destination).
- In addition, there may be knock-on impacts on other businesses that make use of night flights at these airports. For example, businesses in the freight industry using night flights at these airports for express deliveries. To the extent that their competitors make use of night flights at other airports, this could have impacts on their competitiveness.

11.2 Small and Micro Business Assessment (SaMBA)

Small businesses (up to 49 FTE employees) and micro-businesses (up to 10 employees) are not currently exempt from the night flights regime.

Consideration has therefore been given to how the policy options under consideration in this IA may impact on small and micro businesses. As the businesses on which the regime has direct impacts are airports and airlines, it is expected that small and micro businesses are very unlikely to be directly affected by the night flights regime. However, we do not have access to a consistent data source on the number of employees of airlines that operate night flights (e.g. some of these airlines are not UK businesses). So, it is theoretically possible that there could be small or micro businesses that operate night flights which may be affected be the policy options under consideration in this IA. For example, introducing a new QC/0.125 category and counting movements by QC/0 aircraft towards the movement limit could impact on any small or micro businesses that operate such aircraft.

Given the limitations of our available evidence base on this issue at present, we would welcome any evidence that consultees can provide on any of the potential impacts of the policy options on small

and micro businesses; and will take this into account before reaching a final decision on future restrictions.

11.3 Race, Disability and Gender Impact Assessment

The options have been assessed for relevance but the regime is not expected to have any variation in impact on different groups; an Equalities Impact assessment is therefore not required.

Night flights may have a disproportionate impact on those sensitive to noise and those already severely impacted. Our preferred options result in a reduction in the noise emitted in the night quota period over the 5 year regime at all three airports and/or a reduction in the noise quotas at Heathrow and Gatwick to reflect progress in noise management already made.

12 Summary and preferred option with description of implementation plan

There is a need to protect local communities from the negative impacts of aircraft noise at night, while permitting the operation of services that provide benefits to the aviation industry and wider economy. As set out in the 2013 APF, the Government recognises that night noise is the least acceptable form of aircraft noise and as a result it is necessary to ensure that the economic benefits of night flights are balanced with the costs these can impose on communities, including sleep disturbance.

Our joint preferred policy options are 4a and 4b. We hope to gain consultation responses on the optimal, but realistic, QC reduction that could be applied at each airport. With the optimal reduction applied, these options would balance the economic benefit from night flights at the three airports with the noise disbenefit to communities in order to deliver on the environmental objective. Ensuring all flights are included in the restrictions and setting a meaningful cap on quota counts ensures industry have clear direction and incentives to adopt the quietest technology whilst communities have more certainty over the future noise exposure. We are awaiting further evidence to decide which option is best suited to achieve our environmental objective to encourage the use of quieter aircraft to limit or reduce the number of people significantly affected by aircraft noise at night, while maintaining the existing benefits of night flights.

We aim to consult on our proposals in January and plan to respond by June 2017.

Appendix A

Exempt aircraft expected to be covered under a new QC/0.125 category (81.0-83.9 EPNdB):

Arrivals	Departures
Airbus A320-251n	Airbus A320-251n
Airbus A320-271n	Airbus A320-271n
Beechcraft Premier I (Raytheon 390)	BAe ATP
Boeing 717-200	Bombardier Challenger 300 (BD-100-1A10)
Bombardier Challenger 601-3A (CL-600-2A12)	Bombardier Challenger 604 (CL-600-2B16)
Bombardier Challenger 604 (CL-600-2B16)	Bombardier Challenger 605 (CL-600-2B16)
Bombardier Challenger 605 (CL-600-2B16)	Bombardier Challenger 850 (CL-600-2B19)
Bombardier Challenger 870 (CL-600-2C10)	Bombardier CRJ-100LR (CL-600-2B19)
Bombardier CRJ-200ER (CL-600-2B19)	Bombardier CRJ-200ER (CL-600-2B19)
Bombardier CRJ-200LR (CL-600-2B19)	Bombardier CRJ-200LR (CL-600-2B19)
Bombardier Learjet 35A	Bombardier DHC-8-311 Dash 8
Bombardier Learjet 36A	Bombardier DHC-8-402 Q400
Bombardier Learjet 55ER Winglets	Bombardier Learjet 35A
Cessna 525A Citation CJ2	Cessna 525A Citation CJ2
Cessna 550 Citation Bravo	Cessna 550 Citation II
Cessna 550 Citation II	Dornier 328-110
Cessna 560XL Citation XLS	Dornier 328JET-310
Cessna 650 Citation VII	Embraer 120ER Brasilia
Cessna 680 Citation Sovereign	Embraer 120FC Brasilia
Dassault Falcon 2000EX EASy	Embraer 120RT Brasilia
Dassault Falcon 2000EX EASy Winglets	Embraer ERJ-135ER
Dassault Falcon 2000LX	Embraer ERJ-145EP
Dassault Falcon 2000S	Embraer ERJ-145MP
Dassault Falcon 7X	Embraer Legacy 600 (ERJ-135BJ)
Dassault Falcon 900C	Embraer Legacy 650 (ERJ-135BJ)
Dassault Falcon 900EX	Fokker 50
Dassault-Breguet Mystere Falcon 900	Gulfstream G280
Dornier 328JET-300	Gulfstream G300 (GIV)

Dornier 328JET-310	Gulfstream G450 (GIV-X)
Embraer ERJ-135ER	Gulfstream GIV
Embraer ERJ-145EP	Gulfstream GIV-SP
Embraer ERJ-145MP	Gulfstream G650 (G-VI)
Embraer ERJ-190BJ Lineage	Hawker 800B (BAe 125-800B)
Embraer ERJ-190SR	Hawker 800XP (Raytheon Hawker 800XP)
Embraer ERJ-195LR	Hawker 800XPi (Raytheon Hawker 800XP)
Embraer Legacy 600 (ERJ-135BJ)	Hawker 900XP (Hawker Beechcraft 900XP)
Embraer Legacy 650 (ERJ-135BJ)	Saab 2000
Gulfstream G280	Saab 340A Cargo
Gulfstream G450 (GIV-X)	
Gulfstream GIV	
Gulfstream GIV-SP	
Gulfstream GV	
Gulfstream GV-SP (550)	
Hawker 4000 (Hawker Beechcraft 4000)	
Hawker 400XP (Raytheon 400A)	

Appendix B

ANCON type and noise class of each aircraft type.

Aircraft Type	ANCON Type	Noise Class
Small twin-piston	STP	1
Small twin-turboprop	STT	1
Large twin-turboprop	LTT	2
Large four-engined propeller	L4P	2
Boeing 737-300/400/500	B733	3
Boeing 737-600/700	B736	3
Boeing 737-800/900	B738	3
Boeing 757-200 (RB211-535C engines)	B757C	3
Boeing 757-200 (RB211-535E4/E4B engines)	B757E	3
Boeing 757-200 (PW2037/2040 engines)	B757P	3
BAe 146/Avro RJ 3 BA46	BA46	3
Airbus A318	EA318	3
Airbus A319 with CFM56 engines	EA319C	3
Airbus A319 with IAE V2500 engines	EA319V	3
Airbus A320 with CFM56 engines	EA320C	3
Airbus A320 with IAE V2500 engines	EA320V	3
Airbus A321 with CFM56 engines	EA321C	3
Airbus A321 with IAE V2500 engines	EA321V	3
Executive Business Jet (Chapter 3)	EXE3	3
Bombardier CRJ100/200	CRJ	3
Embraer ERJ 135/145	ERJ	3
Embraer E-170	ERJ170	3
Fokker 70/100	FK10	3
McDonnell Douglas MD-80 series	MD80	3
Boeing 767-200	B762	4
Boeing 767-300 (GE CF6-80 engines)	B763G	4
Boeing 777-200 (GE GE90 engines)	B772G	4
Boeing 777-200LR/300ER (GE GE90 engines)	B773G	4
Boeing 787-8	B788	4
Airbus A300	EA30	4
Airbus A310	EA31	4
Airbus A330	EA33	4
Airbus A340-200/300	EA34	5
Airbus A340-500/600	EA346	5
Boeing 747-400 (GE CF6-80F engines)	B744G	5
Boeing 747-400 (PW PW4000 engines)	B744P	5
Boeing 747-400 (RR RB211 engines)	B744R	5
Boeing 747SP	B747SP	5
Boeing 747-8	B748	5
McDonnell Douglas MD-11	MD11	5

Appendix C

Aircraft noise classifications under the current quota count (QC) system

Noise Classification (EPNdB) [59]	Quota Count
More than 101.9	**16**
99 - 101.9	**8**
96 - 98.9	**4**
93 - 95.9	**2**
90 - 92.9	**1**
87 - 89.9	**0.5**
84 - 86.9	**0.25**
Less than 84	**0 (Currently exempt)**

[59] Effective Perceived Noise Decibels, a specialised noise unit used for aircraft noise certification tests. Figures based on average of flyover and sideline for departures, and after 9 EPNdB subtraction from approach value.

Appendix D

The tables below provide further details on the estimated total movements in the night quota period and noise quota usage (QC) under the policy options under consideration in this IA. These tables also show the movement and noise quota limits for each season that were assumed in this analysis.

The boxes highlighted in blue show when an airport exceeds the assumed limit for that season. The airport is allowed to do this through the use of carryovers and overruns. The estimates of total movements and noise quota are rounded to the nearest 10.

Figure 13 – Gatwick forecasts – Policy Option 1 (Do Nothing)

Season	**Total movements excluding current exempt QC/0 aircraft** Movement limits (no carryovers/overruns): Winter = 3250 Summer = 11200	**Total movements including current QC/0 aircraft**	**Total QC** QC limits (no carryovers/overruns): Winter = 2000 Summer = 6200
Winter 2017/18	1820	1880	880
Winter 2018/19	1810	1860	880
Winter 2019/20	1810	1870	870
Winter 2020/21	1810	1870	880
Winter 2021/22	1810	1900	900
Summer 2018	12650	12710	5330
Summer 2019	12650	12710	5330
Summer 2020	12650	12720	5330
Summer 2021	12650	12760	5330
Summer 2022	12650	12800	5340

Figure 14 – Heathrow forecasts – Policy Option 1 (Do Nothing)

Season	**Total movements excluding current exempt QC/0 aircraft** Movement limits (no carryovers/overruns): Winter = 2550 Summer = 3250	**Total movements including current QC/0 aircraft**	**Total QC** QC limits (no carryovers/overruns): Winter = 4080 Summer = 5100
Winter 2017/18	2670	2690	2300
Winter 2018/19	2670	2690	1870
Winter 2019/20	2650	2690	1720
Winter 2020/21	2640	2690	1710
Winter 2021/22	2630	2690	1700
Summer 2018	2800	2810	2320
Summer 2019	2790	2810	1980
Summer 2020	2760	2810	1840
Summer 2021	2750	2810	1820
Summer 2022	2740	2810	1800

Figure 15 – Stansted forecasts – Policy Option 1 (Do Nothing)

Season	**Total movements excluding current exempt QC/0 aircraft** Movement limits (no carryovers/overruns): Winter = 5000 Summer = 7000	**Total movements including current QC/0 aircraft**	**Total QC** QC limits (no carryovers/overruns): Winter = 3310 Summer = 4650
Winter 2017/18	3920	4600	2980
Winter 2018/19	3750	4390	2840
Winter 2019/20	3770	4370	2730
Winter 2020/21	3800	4170	2620
Winter 2021/22	3800	4170	2620
Summer 2018	8020	8910	5120
Summer 2019	8200	9110	5230
Summer 2020	8200	9050	5060
Summer 2021	8200	8740	4880
Summer 2022	8200	8750	4880

Figure 16 – Gatwick forecasts – Policy Option 2 and 4a

Season	**Total movements including QC/0.125 and QC/0 aircraft: Option 2 and 4a** Movement limits (no carryovers/overruns): Winter = 3250 Summer = 11200	**Total QC: Option 2** QC limits (no carryovers/overruns): Winter = 2000 Summer = 6200	**Total QC: Option 4a** QC limits (no carryovers/overruns): Winter = 1655 Summer = 4870
Winter 2017/18	1880	890	890
Winter 2018/19	1810	850	850
Winter 2019/20	1810	850	850
Winter 2020/21	1810	850	850
Winter 2021/22	1810	860	860
Summer 2018	12650	5310	5310
Summer 2019	12650	5300	5300
Summer 2020	12650	5300	5300
Summer 2021	12650	5300	5300
Summer 2022	12650	5300	5300

Figure 17 – Heathrow forecasts – Policy Option 2 and 4a

Season	**Total movements including QC/0.125 and QC/0 aircraft** Movement limits (no carryovers/overruns): Winter = 2550 Summer = 3250	**Total QC: Option 2** QC limits (no carryovers/overruns): Winter = 4080 Summer = 5100	**Total QC: Option 4a** QC limits (no carryovers/overruns): Winter = 2340 Summer = 2520
Winter 2017/18	2690	2300	2300
Winter 2018/19	2690	1870	1870
Winter 2019/20	2690	1730	1730
Winter 2020/21	2690	1720	1720
Winter 2021/22	2690	1710	1710
Summer 2018	2810	2320	2320
Summer 2019	2810	1980	1980
Summer 2020	2810	1840	1840
Summer 2021	2810	1820	1820
Summer 2022	2810	1800	1800

Figure 18 – Stansted forecasts – Policy Option 2

Season	**Total movements including QC/0.125 and QC/0 aircraft** Movement limits (no carryovers/overruns): Winter = 5000 Summer = 7000	**Total QC** QC limits (no carryovers/overruns): Winter = 3310 Summer = 4650
Winter 2017/18	4200	2780
Winter 2018/19	3800	2510
Winter 2019/20	3800	2420
Winter 2020/21	3800	2410
Winter 2021/22	3800	2420
Summer 2018	8200	4790
Summer 2019	8200	4790
Summer 2020	8200	4660
Summer 2021	8200	4620
Summer 2022	8200	4620

Figure 19 – Gatwick forecasts – Policy Option 4b

Season	**Total movements including QC/0.125 and QC/0 aircraft:** Movement limits (no carryovers/overruns): Winter = 3250 Summer = 11200	**Total QC** QC limits (no carryovers/overruns): Winter 2017/18 = 1655 (followed by 5% reduction per year to 1325 in 2021/22) Summer 2018 = 4870 (followed by 5% reduction per year to 3895 in 2022)
Winter 2017/18	1880	890
Winter 2018/19	1810	850
Winter 2019/20	1870	880
Winter 2020/21	1750	830
Winter 2021/22	1630	780
Summer 2018	12650	5310
Summer 2019	12500	5240
Summer 2020	11860	4970
Summer 2021	11210	4690
Summer 2022	10550	4420

Figure 20 – Heathrow forecasts – Policy Option 4b

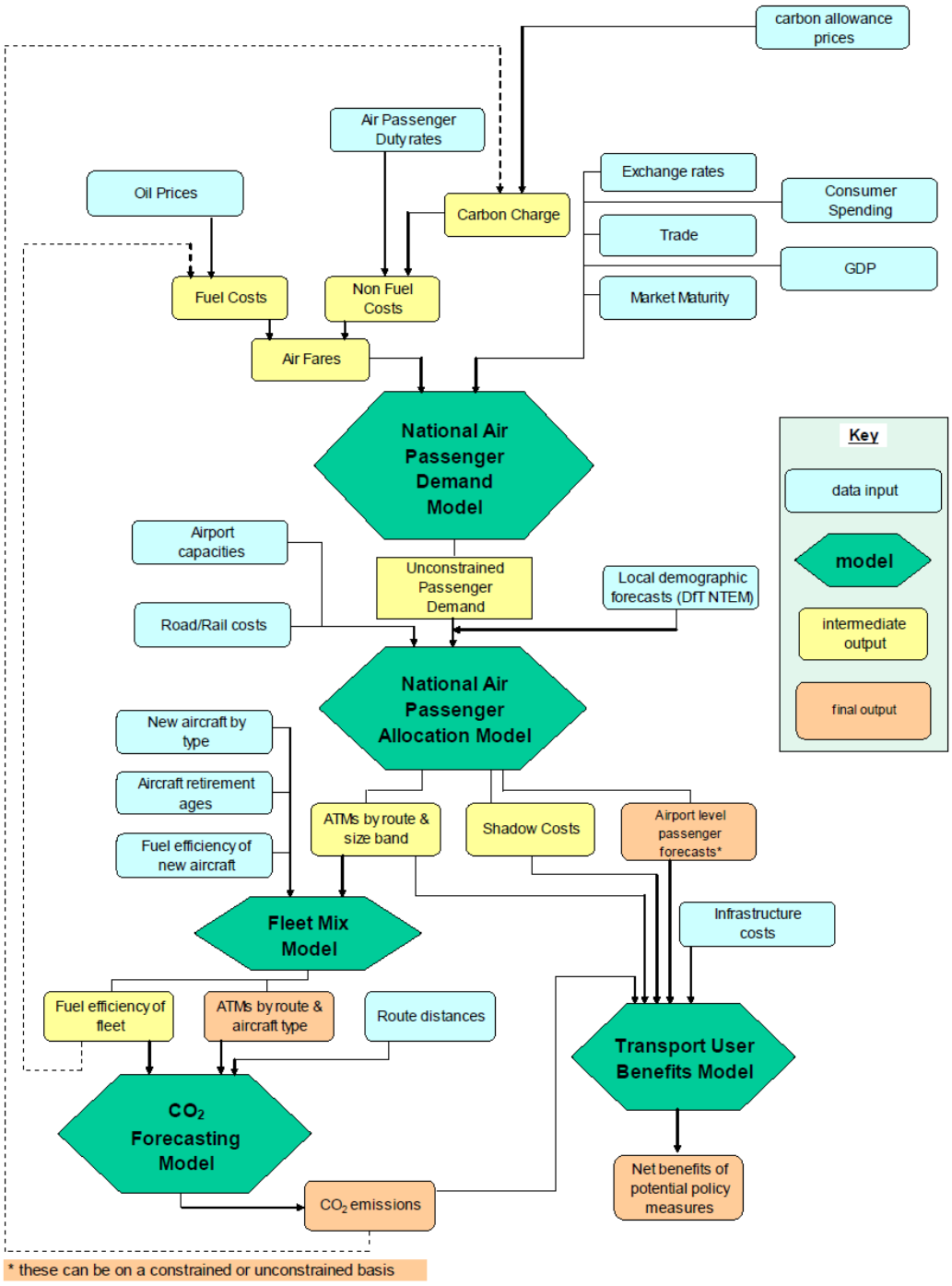
Season	**Total movements including QC/0.125 and QC/0 aircraft** Movement limits (no carryovers/overruns): Winter = 2550 Summer = 3250	**Total QC** QC limits (no carryovers/overruns): Winter 2017/18 = 2340 (followed by 5% reduction per year to 1875 in 2021/22) Summer 2018 = 2520 (followed by 5% reduction per year to 2020 in 2022)
Winter 2017/18	2690	2300
Winter 2018/19	2690	1870
Winter 2019/20	2690	1730
Winter 2020/21	2690	1720
Winter 2021/22	2690	1710
Summer 2018	2810	2320
Summer 2019	2810	1980
Summer 2020	2810	1840
Summer 2021	2810	1820
Summer 2022	2810	1800

Figure 21 – Stansted forecasts – Policy Option 4b

Season	**Total movements including QC/0.125 and QC/0 aircraft** Movement limits (no carryovers/overruns): Winter = 5605 Summer = 8079	**Total QC** QC limits (no carryovers/overruns): Winter 2017/18 = 3310 (followed by 5% reduction per year to 2650 in 2021/22) Summer 2018 = 4650 (followed by 5% reduction per year to 3720 in 2022)
Winter 2017/18	4500	2980
Winter 2018/19	3940	2600
Winter 2019/20	3510	2240
Winter 2020/21	3330	2120
Winter 2021/22	3130	1990
Summer 2018	8910	5210
Summer 2019	8860	5180
Summer 2020	8630	4900
Summer 2021	8230	4630
Summer 2022	7730	4360

Appendix E

UK aviation forecasting framework[60]



[60] Department for Transport. UK Aviation Forecasts. January 2013. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/223839/aviation-forecasts.pdf

Appendix F

To provide an indication of the likely noise impact of the exempt-rated (QC/0) A320neo, the table below illustrates the size and extent of the 60 dBA L_{max} arrival noise footprint for a typical westerly arrival to runway 26L at Gatwick. An outdoor L_{max} level of 60 dBA corresponds to an indoor noise level of approximately 45 dBA, in accordance with the WHO recommendation that individual noise events at night exceeding 45 dBA should be avoided.

For comparison, the equivalent footprint for the current model of the A320 (QC/0.25) is shown, which is the most common aircraft type currently operating at Gatwick during the night quota period.

Results indicate that whilst the noise footprint of the new A320neo is significantly smaller than the current A320, the impacts of a QC/0 rated aircraft are not insignificant.

A320neo L_{max} arrival footprint areas[61]

Aircraft	Arrival footprint	Area, sq km	Population	Households
A320neo	Westerly, 60dBA	49.6	7,800	3,000
	Easterly, 60dBA	48.1	2,700	1,100
A320	Westerly, 60dBA	85.4	20,300	8,300
	Easterly, 60dBA	78.3	9,900	4,200
Differences	Westerly, 60dBA	-42%	-62%	-64%
	Easterly, 60dBA	-39%	-73%	-74%

[61] CAA Data, 2016

Appendix G

Please respond to these questions using our online survey at https://www.smartsurvey.co.uk/s/J6KX6, or email your responses to night.flights@dft.gsi.gov.uk, including any relevant evidence and the question it refers to. Please note that commercially sensitive information should only be emailed, not uploaded online.

A. What evidence do you have on the validity of the assumptions we have made about industry behaviour (section 7.1.2), particularly about how airports make use of carryover and overrun flexibility and which flights are affected when an airport reaches either its movement or quota limit?

B. What evidence do you have on how airlines that have ordered new aircraft types (such as the Airbus A320neo and the Boeing 737 Max) plan on introducing these into their fleets (section 7.1.4.)?

C. What evidence do you have on how airlines and passengers would respond to our proposals, including whether any flights or journeys would be rescheduled to or from the night quota period (sections 6.2.6 and 7.3)?

D. What evidence do you have on the amount of time needed for stakeholders to read and understand the regulations needed to implement our proposals (section 8.2.2)?

E. What evidence do you have on the monetary value of the direct impacts of our proposals on business (sections 8 and 10)?

F. What other evidence do you have on the costs and benefits of our proposals (section 8)?

G. What evidence do you have on the wider impacts of our proposals (section 11), particularly the impacts on competition and small and micro businesses?

H. What evidence do you have on the optimal reduction in noise quota limits that should be applied at each airport to achieve the environmental objective (section 12)?

I. What other evidence do you have that could improve the analysis in this impact assessment?