

Title: Night Flight Restrictions at the Designated Airports, 2017-2022

IA No: DfT00370

RPC Reference No: RPC17-3554(2)-DfT

Lead department or agency: Department for Transport

Other departments or agencies: NA

Impact Assessment (IA)

Date: 12/07/17

Stage: Final

Source of intervention: Domestic

Type of measure: Secondary legislation

Contact for enquiries: David Hyde,
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Summary: Intervention and Options

RPC Opinion: fit-for-purpose

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
£-12.18m	£-10.91m	£2.2m	In scope	Qualifying provision

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

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 the 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. However, there is a need to balance these negative externalities on local residents with the economic benefits that night flights offer to the aviation industry and wider economy, including increased flight choice (allowing passengers to fly when convenient for them and to a wide range of destinations) and next-day deliveries of urgent or perishable products.

Currently there is no market process in place to ensure the benefits of night flights are balanced against the local impacts. Without Government intervention, the existing restrictions at Gatwick, Heathrow and Stansted would end in October 2017, and there could be an unlimited amount of flights operating in the night period. In this case, the Government considers that there would be a failure to protect communities from the noise impacts of night flights.

While at other airports in the UK night noise is managed locally, usually as agreements between the airport and local authorities, under the existing policy and legal framework the Secretary of State has responsibility for setting night flight restrictions at Heathrow, Gatwick and Stansted. The Government recently consulted on changes to this framework, which could see night flight restrictions set via other processes in the future. The outcome of that consultation is yet to be determined however and there are no alternatives to Government intervention. Therefore there is currently a rationale for the Government to intervene to address the problem under consideration, namely to strike a balance between the local impacts of night flights and the economic benefits they bring. A 'Do Nothing' option is not an appropriate baseline as it is not feasible for the Government to completely remove all regulation on night flights at the designated airports, reasons for this are given at Section 5.2. The impacts of the proposed policy options are therefore compared against a 'do minimum' option based on a continuation of the current regime.

What are the policy objectives and the intended effects?

The environmental objective we have set for these airports is to 'limit or reduce the number of people significantly affected by aircraft noise at night, including through encouraging the use of quieter aircraft, while maintaining the existing benefits of night flights'. Rules on the adoption of operating restrictions, such as the night flight regime, require them to be no more restrictive than is needed to achieve the environmental objectives for that airport. These rules however do not specify the exact restrictions that should be in place at an individual airport or airports and this is a domestic policy decision.

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

In this final stage impact assessment, we have considered four options to achieve the objective outlined above. Based on consultation responses and further analysis, we have repackaged the options that were presented at consultation stage. These options are now:

1. Option 1: Do Minimum. The current regime continues beyond expiry in October 2017 with no changes.
2. Option 2. Incorporate QC/0 aircraft into movement limits for all three airports, and accommodate the number of currently exempt aircraft at Stansted by increasing their movement limit. These changes would take effect from the start of the next regime (Winter 2017). This option ensures the growing number of QC/0 aircraft are included in the regime and subject to the requirements.
3. Option 3: As option 2, but further implementing a new QC/0.125 category to be introduced in the second year of the regime (Winter 2018). This option ensures the noise impacts of aircraft are better reflected in the noise quota allowance of the regime.
4. Option 4: As option 3, but from Winter 2018 to also reduce noise quota limits at Heathrow and Gatwick to a level based on the current average QC per movement. This removes 'headroom' or inefficiency in the current policy (see section 5.4.2 for further detail on the methodology for calculating these reductions).

Our preferred option is Option 4, which builds on all the other options, and best achieves our objective as set out above. The changes to the QC system that this package would include would ensure communities are protected from the theoretically unlimited number of QC/0 aircraft movements that could otherwise occur (in a do minimum scenario, Option 1), and ensures that there is greater transparency so communities know how much noise they can expect to experience over the next five years of the regime. As a result of incorporating QC/0 aircraft into the movement limit, it is necessary to adjust Stansted's movement limits by the existing number of aircraft that will be brought into the restrictions to ensure the existing benefits of night flights are maintained. Finally, reducing noise quotas at Heathrow and Gatwick to a level based on current usage incentivises the continued use of quieter aircraft and 'locks-in' the benefits that have been delivered through the introduction of quieter aircraft in recent years. Option 4 reflects all of these changes. The results suggest a negative NPV based on the impacts that have been monetised. There are a number of non-monetised benefits that we believe warrant Option 4 being the preferred option, including the transparency and future certainty that this options provides communities.

A full analysis of all options is found in Section 8 and at Appendix C to this impact assessment.

Will the policy be reviewed? Yes		If applicable, set review date: Restrictions expire in 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: NQ		Non-traded: NQ	

I have read the Impact Assessment and I am satisfied that (a) it represents a fair and reasonable view of the expected costs, benefits and impact of the policy, and (b) that the benefits justify the costs.



Signed by the responsible Minister: Rt Hon Chris Grayling MP Date: 12/07/2017

Summary: Analysis & Evidence

Preferred option (Option 4)

Description: From Winter 2017: Incorporating QC/0 aircraft into movement limits for all three airports, and accommodating the number of currently exempt aircraft movements at Stansted by increasing their movement limit. From Winter 2018: Implementing a new QC/0.125 category and reducing noise quota limits at Heathrow and Gatwick to a level based on the current average QC per movement.

FULL ECONOMIC ASSESSMENT

Price Base Year: 2015	PV Base Year: 2017	Time Period Years: 5	Net Benefit (Present Value (PV)) (£m)		
			Low: NQ	High: NQ	Best Estimate: -£12.18m

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	£0		£2.7m	£12.4m

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

Under Option 4, it is estimated that there would be fewer flights in the night quota period (NQP) at Gatwick and Stansted across the 5 year regime compared to the Do Minimum scenario. It is estimated that the direct costs to airports and airlines from the reduction in flights in the NQP would be around £1.2m per year at Gatwick and around £1.1m per year at Stansted on average over the 5 year regime (in constant prices); and that the reduction in flights in the NQP at both airports would also result in a total reduction in tax revenues of around £0.3m per year on average over the 5 year regime (in constant prices).

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

It is also expected that the reduction in flights in the NQP at Gatwick and Stansted would result in a number of other (non-monetised) costs to businesses, passengers and the government (see Section 8). However, it is estimated that there would be no change in the number of flights in the NQP at Heathrow and therefore no costs are expected at Heathrow.

BENEFITS (£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	£0		£0.0m	£0.2m

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

Under Option 4, the total value of the reduction in sleep disturbance from flights in the NQP over the 5 year regime is estimated at around £0.01 million at Gatwick and around £0.2 million at Stansted (in constant prices).

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 at Gatwick and Heathrow, but be reduced by around 50 people at Stansted. By 2021/22, it is estimated that the number of people within the 48dBA LAeq, 6.5hr night contour would remain the same at Gatwick and Heathrow, but be around 300 less at Stansted. These impacts are relative to a world in which the current night flight restrictions continue. The non-monetised noise

benefits are therefore expected to be higher at Stansted than at Gatwick and Heathrow. Furthermore, at all three airports, introducing a new 0.125 QC category and counting all movements towards the limit, as well as reducing the noise quota limit at Gatwick and Heathrow, will increase the transparency of the regime and provide more certainty for communities on the number of flights and amount of noise that can be expected during the night quota period.

Key assumptions/sensitivities/risks

Discount rate (%)

3.5%

As mentioned in the main text, the analysis has a number of limitations, which means that the results of the quantitative analysis presented in this IA are subject to considerable uncertainty. This means that there is uncertainty around both the impacts of the policy options and any comparisons that are made between the policy options. All analysis has been subject to the Department's Quality Assurance processes. Please refer to the text in the IA for a full discussion of the limitations of the various strands of the analysis.

BUSINESS ASSESSMENT

Direct impact on business (Equivalent Annual £m:

Costs: £2.2m | Benefits: £0 | Net: -£2.2m

Score for Business Impact Target

(qualifying provisions only) £m: £11.0m

1 Background

The government recognises the need to protect local communities from the negative impacts of aircraft noise at night, such as the impact on the quality of sleep, while permitting the operation of services that provide a range of benefits to the aviation industry and wider economy. These benefits include increased flight choice (allowing passengers to fly when convenient for them, which is particularly important for business passengers), the opening up markets and fostering of international trade (including facilitating next day deliveries or urgent or perishable products), encouraging investment in the UK by domestic and foreign investors, improving business efficiency and raising productivity, and spurring growth in the tourism sector. However current Government policy, as set out in the 2013 Aviation Policy Framework (APF), also recognises that night noise is widely regarded as the least acceptable form of aircraft noise and, as a result, it is necessary to ensure that these economic benefits of night flights are balanced with the costs these can impose on communities, including on the quality of sleep.¹

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. Please note the phrases night flights restrictions, night flights regime, 'the regime' are used interchangeably in this impact assessment.

The underlying principle of the restrictions has been to balance the benefits of night flights 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 and those with higher QC classifications use a greater amount of an airport's noise quota (see Appendix B). The noise quota limit

¹ DfT 'Aviation Policy Framework', 2013
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/153776/aviation-policy-framework.pdf

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 lowest QC category is QC/0.25, which applies to aircraft with a noise level between 84 and 86.9 EPNdB². 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 or widespread and prolonged air traffic disruption. No changes to the rules regarding dispensations are being considered as part of this current review of the restrictions, though we will continue to monitor their usage. 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 the sleeping patterns of individuals. There has been growing evidence, as set out in Section 6.1 of this Impact Assessment, on the relationship between exposure to higher levels of aircraft noise at night, sleep disturbance, and adverse health effects. There is a need therefore to balance these negative externalities on local residents with the economic benefits that night flights offer to the aviation industry and wider economy, including increased flight choice (allowing passengers to fly when convenient for them, particularly important for business passengers) and next-day deliveries of urgent or perishable products. There is currently no market mechanism in place to ensure this balance, which calls for a role for the Government.

The power for the Secretary of State to set night flight restrictions for designated airports is granted under section 78 of the Civil Aviation Act 1982. This allows action to be taken to avoid, limit or mitigate the impacts of 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, similar restrictions exist at some other airports – which are often the result of local planning conditions.

² Effective Perceived Noise level in decibels

Current Government policy, as set out in the APF in 2013, is that in general noise controls are best agreed locally. However, 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.

The current night flight restrictions are due to expire in October 2017. Therefore, on 12th January 2017 the Government launched its consultation on replacement restrictions for the regime. Following the publication of this consultation, on 2 February 2017 the Government launched a consultation, '*UK Airspace Policy: a framework for balanced decisions on the design and use of airspace*'. This latter consultation includes proposals for how noise should be managed at all airports in the future, and contains proposed measures to bring the system for managing noise at the currently designated airports in line with those at other airports. This consultation was due to close on 25 May and responses are being considered by the Department for Transport before final policy decisions on these policies are made. Without prejudice to the outcome of that process, this could see night flight restrictions no longer being set by the Government at these airports in the future if restrictions can be agreed through some other means such as through the planning process or through engagement with local communities. Given however that the restrictions expire in October 2017, there is a need for the Government to provide certainty on the night flights rules which will apply at the three airports when the current regime lapses. The regime therefore needs to be set before any decisions have been made on the future of the Government's role and will therefore be done so under the existing framework.

In impact assessments it is customary to consider whether any alternatives to Government intervention exist. Besides from the reasons set out above referring to the rationale for Government's current role at these airports, there are also legal rules governing the introduction of operating restrictions – even voluntary ones. Even if the Government had reached a decision on its proposals in the UK Airspace Policy consultation, there would not be sufficient time for another body to be appointed as the competent authority, consult on and agree restrictions before the current regime lapsed³. At this moment in time therefore, Government regulation is the only option to ensure the impacts of night flights are adequately managed.

A failure to act by the Government could lead to a substantial increase in the number of night flights at any of the three airports. Given the noise impacts of these flights, this is not considered a viable option. Additionally, intervention is required in this market as an unregulated market would almost certainly impose a disproportionate negative noise impact on communities around an airport.

3 Policy Objective

The night flight restrictions set by the Government are an example of noise-related operating restrictions and there are European rules governing the introduction of these at airports, based on the International Civil Aviation Organisation's (ICAO) balanced approach. 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

³ New Regulations concerning the introduction of operating restrictions (Regulation (EU) 598/2014) apply from 13 June 2016 where consultation on those restrictions began after this date.

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 these rules 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 environmental objectives for the airport in question. The Government must therefore give consideration to what are appropriate environmental objectives for each airport. These rules do not however specify what action should be taken at an individual airport or airports and these are **domestic policy decisions**.

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 current regime that began in October 2014.

Given the Government's announcement on 25 October 2016 that a new north west runway at Heathrow was its preferred scheme for delivering new capacity in the south east, and that the Government expects there 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 Heathrow⁴. 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.

In our consultation document, we also considered that given the capacity constraints in the south east and the business models of the airlines based at Gatwick and Stansted, it was important to maintain the benefits offered by night flights so that capacity in the south east is not constrained further before a new runway at Heathrow is operational.

We therefore proposed that the next regime should ensure that the existing benefits of night flights were maintained while delivering the best possible improvements in the noise climate. As a result, the environmental objective proposed in our consultation document was 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'**.

There are also potential opportunities for both Heathrow and Stansted to agree night flight restrictions through other means in the coming years. This objective would therefore ensure that alongside improvements in the noise climate around these airports, the next regime would leave scope for local decisions to be made on night flights in the future.

The majority of responses to our consultation disagreed with our proposed objective. A large number of responses argued that quieter aircraft would not prevent disturbance for those living around airports, and that the objective should therefore be to prevent any flights from operating at all during the night, or to gradually phase them out- with various differing suggestions for the length that should be, most commonly 8 hours.

There was also a large number of responses, including from one campaign that was resubmitted around 800 times, that suggested the wording of the objective prevented measures being taken that would reduce the number of night flights and that the benefits of night flights were not defined. A range of benefits as a result of a reduction in the number of night flights has been clearly outlined

⁴ Airports Commission. Final Report (2015).

in this impact assessment in Section 6.2, and where possible, some of the impacts as a result of a reduction in the number of flights are monetised.

Other responses from communities argued that the way the objective was worded represented a weakening from one of the environmental objectives from the 2014 regime, to 'limit and where possible reduce the number of people significantly affected by aircraft noise at night' and was focused solely on encouraging quieter aircraft rather than reducing the negative impacts of noise.

On the other hand, some responses from industry suggested that rather than focusing on reduction of noise at source, other pillars of the balanced approach, especially land-use planning, needed to be considered. Having considered consultation responses on the environmental objective, the Government continues to believe the proposed approach remains the correct one and that for the reasons described at the beginning of this section the next regime should focus on reducing the impacts of noise while maintaining the existing benefits of night flights – which are identified in Section 6 of this document. We do recognise however that the focus of the objective should be on limiting and, where possible, reducing the harmful impacts of night noise rather than solely encouraging the use of quieter aircraft. For our final environmental objective, we have therefore decided to alter the wording slightly from that proposed at consultation stage to: **'limit or reduce the number of people significantly affected by aircraft noise at night, including through encouraging the use of quieter aircraft, 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 (90EPNdB⁵) should be exempt from the regime. A Department of Transport sleep study⁶ had suggested that noise below 80 dB L_{max} (90 EPNdB equates to roughly 75 dB L_{max}⁷), was unlikely to cause sleep disturbance⁸. After 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 Noise⁹, stating that noise events exceeding 45 dBA¹⁰ L_{max} indoors should be limited if possible. It noted that people should be able to sleep with a bedroom window slightly open (a reduction from outside to inside of 15 dB¹¹), therefore equating to an outdoor L_{max} of 60 dBA.

⁵ 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.

⁶ Ollerhead J B et al, Report of a Field Study of Aircraft Noise and Sleep Disturbance, Department of Transport, December 1992.

⁷ L_{max}; The maximum A-weighted sound level (in dBA) measured during an aircraft flyby

⁸ Survey of attitudes to aviation noise. SONA Analysis completed for Department for Transport, 2017. Available at <https://www.gov.uk/government/publications/survey-of-attitudes-to-aviation-noise>

⁹ World Health Organisation. WHO Guidelines for Community Noise, 1999.

<http://www.who.int/docstore/peh/noise/guidelines2.html>

¹⁰ 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.

¹¹ dB; Unit of relative sound level or changes in sound level

Although currently exempt aircraft are quieter than those included in the limits, they do create noise that could result in sleep disturbance. There is a risk therefore that by exempting aircraft, movements and associated noise can increase. 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. In other words, despite the exemption, noise did not increase.

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% overrun¹². Additionally, 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 will 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 will be introducing their first A320neos this summer season¹³ and expect about a third of their fleet to be comprised of Airbus A320neos by 2021¹⁴ and Ryanair also have 100 confirmed orders for the Boeing 737-MAX, which may also fall into the currently exempt category once certified.¹⁵

Without changes to the existing QC system, there is therefore 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 result in adverse impacts on sleep quality and health. Additionally, there could be impacts on air quality and climate change, as well as other local impacts. 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.

¹² 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.

¹³ Easyjet presentation, available at <http://www2.westsussex.gov.uk/ds/cttee/gat/gat260117i12.pdf>

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

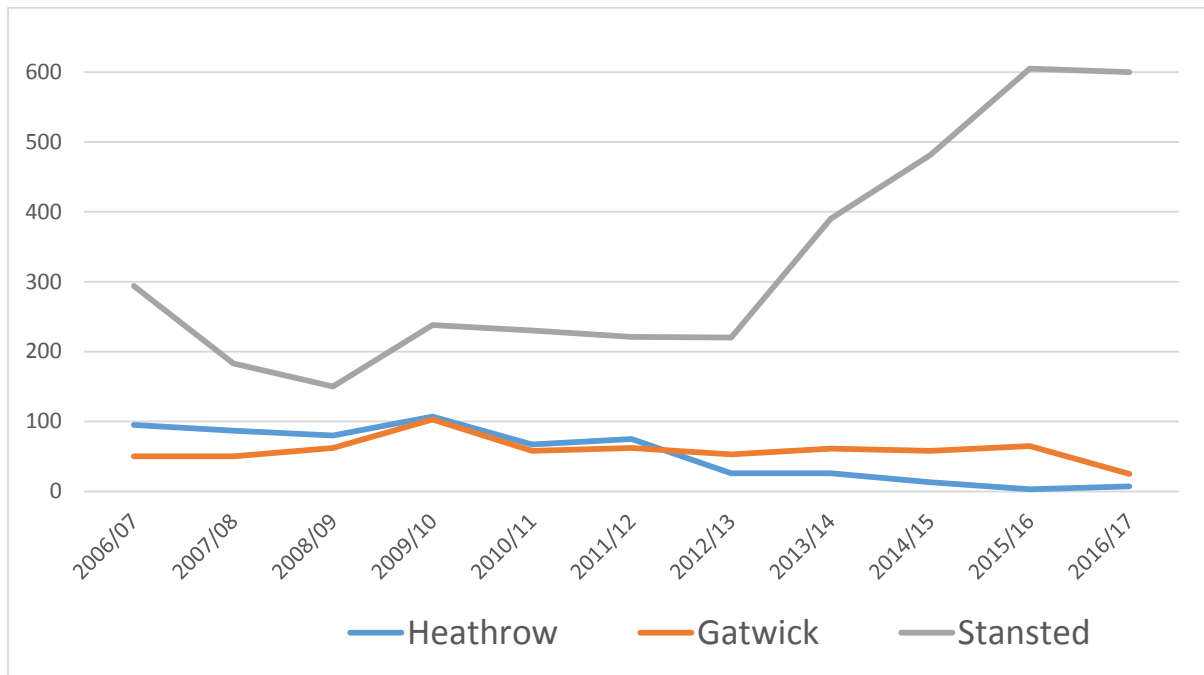
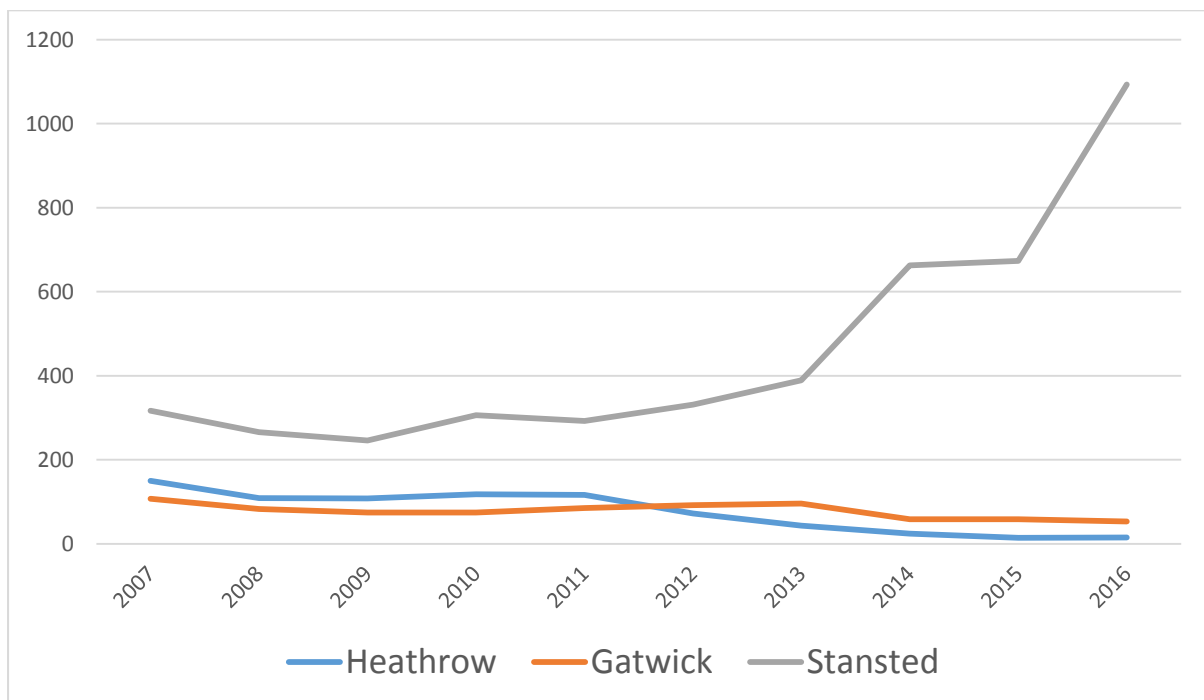


Figure 3 - Number of exempt movements in the summer season



As can be seen from Figure 2 and Figure 3, Gatwick and Heathrow currently have a far smaller number of exempt movements compared to Stansted. However, the 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 movements¹⁶.

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'. As mentioned above, 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

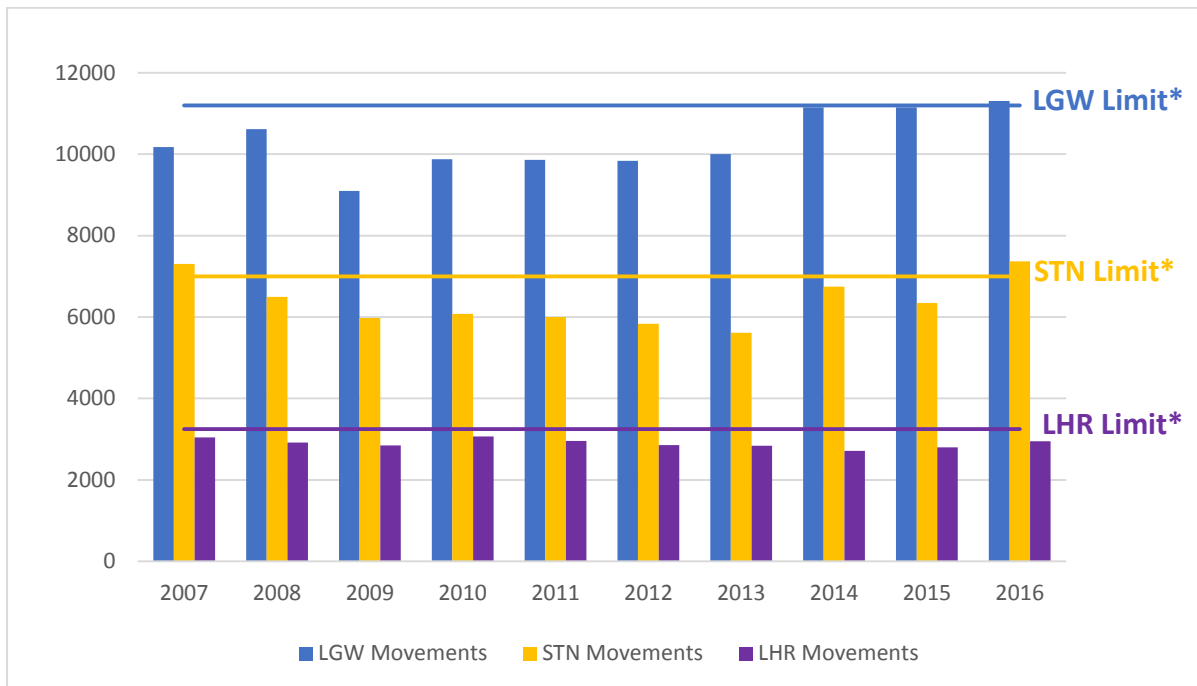
As with the movement limits, it was decided in July 2014, when the regime was last reviewed, to make no changes to the airports' noise quota limits. The purpose of a noise quota limit alongside a movement limit is to incentivise the use of quieter aircraft to maximise the number of flights that can take 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. For instance in Summer 2016, Heathrow used only 45% of its noise quota limits and Gatwick 79%, whilst 91% and 101%¹⁷ of movement limits were used respectively¹⁸. 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 to limit and, where possible, reduce the number of people significantly affected by aircraft noise at night and that 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).

¹⁷ With carryovers from the previous season.

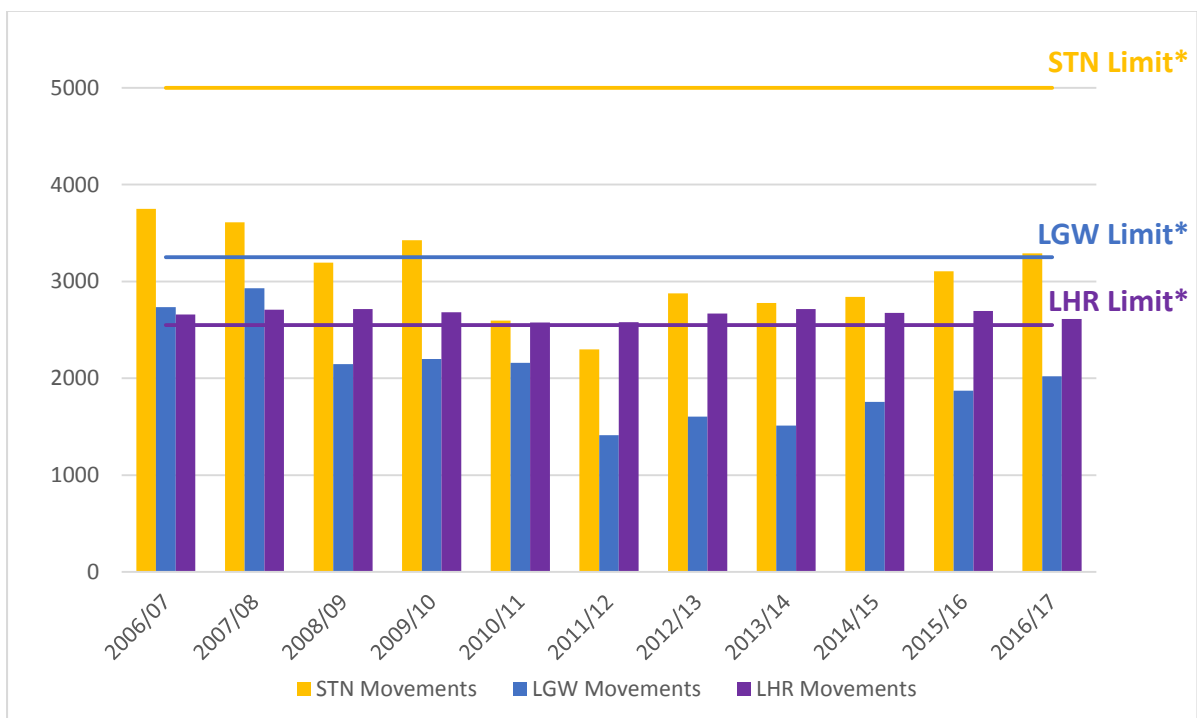
¹⁸ Based on monthly monitoring data submitted to the Department by airports.

Figure 4 - Summer movement usage



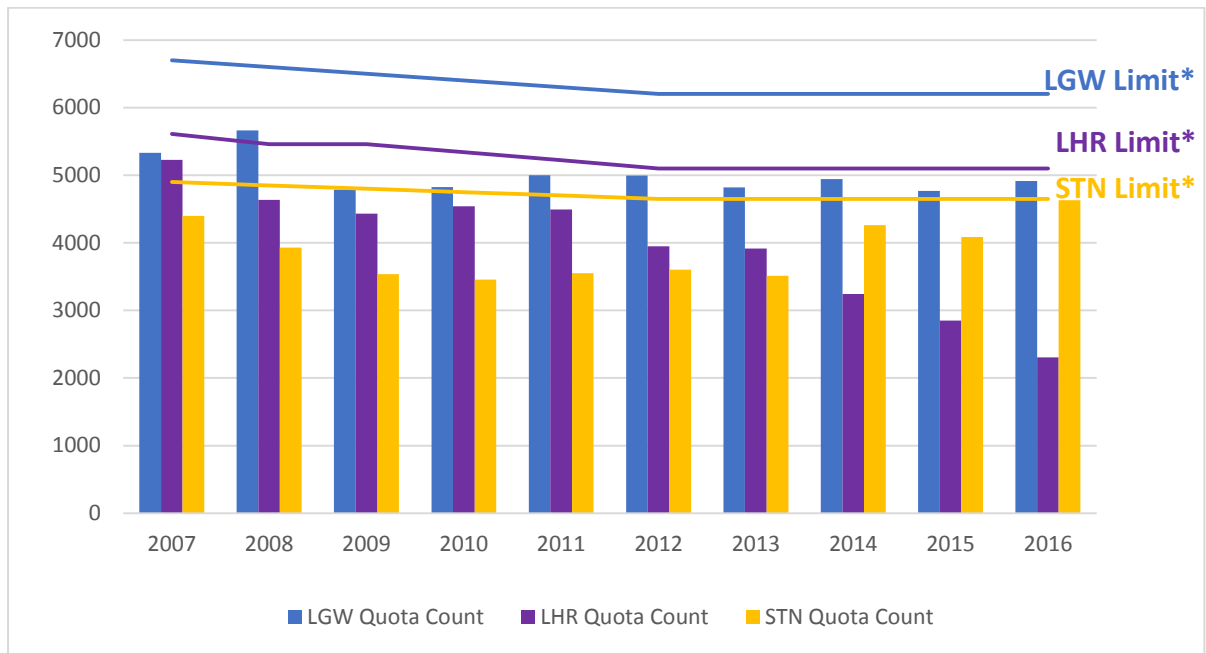
* Refers to seasonal movement limit excluding any carry over from previous season and any over-run
Source: Based on monthly monitoring data submitted to the Department by airports.

Figure 5 - Winter movement usage



* Refers to seasonal movement limit excluding any carry over from previous season and any over-run
Source: Based on monthly monitoring data submitted to the Department by airports.

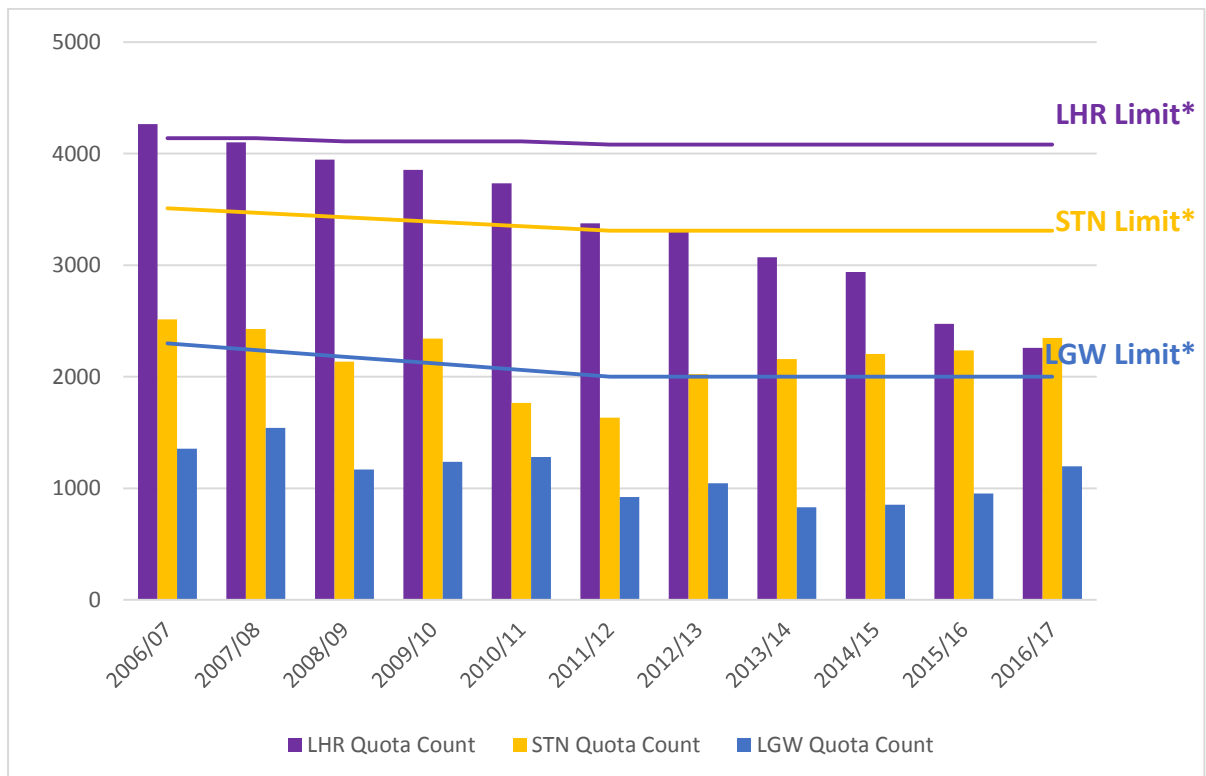
Figure 6 - Summer noise quota usage



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

Source: Based on monthly monitoring data submitted to the Department by airports.

Figure 7 - Winter noise quota usage



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

Source: Based on monthly monitoring data submitted to the Department by airports.

5 Description of options considered

Given the considerations outlined above and the overarching environmental objective, the policy options we proposed in our consultation stage impact assessment were:

1. Do Minimum. The current regime continues beyond expiry in October 2017 with no changes (referred to as Option 1 in the consultation)
2. Implementation of a new QC/0.125 category, and incorporating QC/0 aircraft into movement limits for all three airports (referred to as Option 2 in the consultation)
3. As 2, plus uplift movement limits at Stansted by the current number of QC/0 movements to accommodate the number of currently exempt aircraft movements (referred to as Option 3 in the consultation)
- 4a. As 3, but also reducing noise quota limits at Heathrow and Gatwick to a level based on the current average QC per movement (referred to as Option 4a in the consultation)
- 4b. As 4a, but also further reducing the noise quota limits at all airports gradually over the 5 year regime period, for example by 5% per year (referred to as Option 4b in the consultation)

We asked for evidence on the expected impacts of these options in our consultation in order to help us reach a decision on the final option and to inform what noise reductions under Options 4a and 4b would realistically be achievable while maintaining the existing benefits of night flights. Based on consultation responses, we have repackaged the above options at this final stage and analysed the cost and benefit impact of each of these. We have therefore considered the following options in reaching our final policy decision:

- Option 1: Do Minimum. The current regime continues with no changes.
- Option 2. Incorporate QC/0 aircraft into movement limits for all three airports, and accommodate the number of currently exempt aircraft movements at Stansted by increasing the movement limit. These changes would take effect from the start of the next regime (Winter 2017).
- Option 3: As option 2, but further implementing a new QC/0.125 category to be introduced in the second year of the regime (Winter 2018).
- Option 4: As option 3, but from Winter 2018 to also reduce noise quota limits at Heathrow and Gatwick to a level based on the current average QC per movement. This removes 'headroom' or inefficiency in the current policy (see Section 5.4.2 for further detail on the methodology for this).

Based on analysis of these options, see Section 8 and 13.1 Appendix C, we have reached the conclusion that Option 4 is best suited to achieve the environmental objective as it incorporates all of the components of the other options.

5.1 Alternatives to regulation

As stated in earlier sections, current Government policy is Gatwick, Heathrow and Stansted 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 is currently reviewing its role at these three airports following the UK Airspace Policy consultation, it is not possible for any changes to be made without proper public consultation. Our consultation on the next night flights regime made clear however that if changes to the Government's role are made at these airports, then the Government would allow more airport-specific bespoke arrangements to be made

at the designated airports in the future, provided there has been appropriate consultation and all legal requirements have been followed. The consultation made clear that it would be 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 prevent alternatives to Government regulation taking effect from the beginning of the next regime, as there would not be sufficient time for another competent authority to give the required notice for any voluntary operating restrictions before the regime lapses.

There are several opportunities for more bespoke arrangements to be agreed in coming years in parallel to or as a replacement for the night flights regime if these changes to policy are made. At Heathrow, the Government has announced it expects a ban on scheduled night flights for a period of six and a half hours, between the hours of 11pm and 7am, as a condition on new runway capacity. The rules around its operation, including the exact timings of such a ban, should be defined in consultation with local communities and relevant stakeholders, in line with the requirements of EU Regulation 598/2014. Stansted has also announced it intends to seek planning permission to increase their current passenger cap this year and it could therefore agree restrictions at a local level as part of this agreement. While we are not aware of any intention for Gatwick to agree local planning conditions over the course of the regime, the proposals made in the UK Airspace Policy consultation do offer the opportunity for restrictions to be agreed outside of the planning process and pending the outcome of that consultation this may offer Gatwick the opportunity to agree local restrictions.

The next night flights regime will be adopted in line with rules that require noise to be managed in line with ICAO's Balanced Approach. Therefore, action to address noise should be airport specific and address noise in the most cost-effective way, with operating restrictions that limit the number of flights, 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; reduction of noise at source, land-use planning, and operational procedures. These alternative measures are discussed below.

5.1.1 Reduction of noise at source

Noise certification of aircraft aims to ensure the latest technology to reduce noise is incorporated in to the design of aircraft. Modern aircraft are considerably quieter than previous generations, with this improvement driven primarily by quieter engines. As a result the noise emissions of modern jet aircraft have reduced considerably since the first models.

The Government expects industry to continue the good progress already made in addressing the problems caused by aircraft noise. The UK was instrumental in securing an agreement on a tougher international noise standard in the ICAO Committee on Aviation Environmental Protection (CAEP). This requires new types of large civil aircraft, from 2017, to be at least 7dB quieter in total, across the three test points, than the current standard. Standards for smaller aircraft will be similarly reduced in 2020.

Several new types of aircraft will also come into service at the designated airports over the next few years that will be quieter than the aircraft they will gradually replace. This includes the introduction of the Airbus A320neo, Airbus A350, Boeing 737 MAX and Boeing 777X. While no aircraft can be completely silent, the new generation of aircraft coming into service have a noise footprint that is typically 50% smaller on departure, and at least 30% smaller on arrival, than that of the aircraft they are replacing.

In addition to the introduction of quieter aircraft at the designated airports, modifications to the existing Airbus A320 family of aircraft, which are known to emit a high-pitched 'whine' 7 to 15 miles from the airport, are also expected during the period covered by the current and next night flight regimes. All new A320s produced by Airbus will have flow detectors installed to suppress this distinctive sound created by these aircraft, and two airlines with a significant number of night operations at Gatwick, British Airways and easyJet, have agreed to retro-fit these modifications to existing aircraft by the end of 2017 and early 2018 respectively. Gatwick have also raised landing charges for non-retrofitted aircraft as of April 2017, as part of the airport's response to the Independent Arrivals Review.

Heathrow are also working to encourage airlines to retrofit noise reducing technology to the A320 family of aircraft that use the airport. While none of these models are scheduled in the night quota period, this could lower noise from unscheduled movements that arrive between 2330 and 0600.

While aircraft have become quieter in recent years and new quieter aircraft will continue to come into operation over the next few years, as Appendix E demonstrates, even the quietest commercial aircraft that will operate in the next five years of the regime will still produce noise levels which could lead to sleep disturbance and this measure alone is not sufficient to address the noise impacts that would result from unrestricted night flights over the course of the next regime.

5.1.2 Land-use planning

The second pillar of the Balanced Approach is land-use planning. Primarily this aims to ensure that new airport developments are located away from noise-sensitive areas and that only compatible land-use development takes place in areas affected by aircraft noise. Other measures include mitigating the effects of noise on development, for example through building codes and noise insulation, and making use of financial instruments such as capital improvements, tax incentives and noise-related airport charges for revenue generation to assist in funding noise mitigation efforts.

The Balanced Approach does recognise, that in some situations, such as locations lacking available land, the opportunity to incorporate all of the land-use planning principles that could prevent aircraft noise problems arising may be limited, but urges states to do so where possible.

The Government's National Planning Policy Framework (NPPF) aims to prevent development where noise can give rise to adverse effects. Research recently carried out by the CAA¹⁹, suggests Government policy, along with regulatory levers, has had success in preventing inappropriate residential development in the areas subjected to the highest noise impacts. Furthermore, planning guidance has ensured that appropriate protection is incorporated into developments experiencing lower levels of noise.

Noise insulation schemes are also in place at all three of the designated airports. While these reduce the noise levels experienced from aircraft, the WHO recommended that people should be able to sleep with a bedroom window slightly open, and as Appendix E demonstrates, even the quietest aircraft can cause sleep disturbance in these instances.

In addition, several local authorities around the designated airports have taken steps to ensure that the development that takes place around airports is appropriate. Crawley Borough Council, in which Gatwick is located, adopted its local plan in 2015 which included its own noise policy that sets specific

¹⁹ Study on the population trends in the vicinity of ten UK civil airports, 2017.
<http://publicapps.caa.co.uk/docs/33/CAP%201204%20FEB17.pdf>

standards for development in noise sensitive areas and preventing noise sensitive development above certain noise levels. Around Heathrow, the London Boroughs of Richmond, Hounslow and Hillingdon are also developing a joint strategic planning policy document for noise.

Several responses to our consultation, from industry as well as local authorities, raised the issue of land-use planning. Arguments on this subject included that local authorities lacked sufficient powers to prevent development in noise-sensitive areas, and that recent house building in high-noise contours has reduced some of the improvements that have been brought about by new technology. The Government does appreciate the role that land-use planning can play in addressing noise problems and part of the work on the upcoming aviation strategy will explore the theme of sustainable growth and will be an opportunity for stakeholders to feed in views on these matters. Land-use planning will not however address the noise impacts that already exist or that will be present over the course of the next regime.

5.1.3 Operational procedures

Noise can also be reduced by ensuring aircraft are flown in a particular way. Examples of operating procedures include:

- the use of noise preferential routes or runways to direct the flight paths of aircraft away from noise-sensitive areas (or to provide periods of respite for certain areas at certain times of day);
- the use of specific take-off or approach procedures (such as Continuous Descent Operations, or steeper landing trajectories) to optimize the distribution of noise on the ground;

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). There may be further opportunities to reduce noise for communities through the modernisation of airspace and other new operational procedures over the next few years. For instance, Heathrow recently trialled a steeper angle of descent for arriving aircraft. The results of this trial indicate these steeper approaches would have minimal, if any, negative effect on Heathrow's operation whilst exposing local residents to less aircraft noise. Heathrow plan to undertake further trials later this year with the view to making these changes permanent.

Following the Independent Arrivals Review published in 2016, Gatwick Airport has also agreed to several recommendations that will address noise impacts, including at night, and which have either been implemented or in the process of being so.

Further benefits of airspace modernisation may also include those that come through more accurate satellite-based navigation that enables aircraft to better avoid populated areas. The Government's consultation on UK Airspace Policy set out various proposals to ensure that the benefits of airspace modernisation are fully realised in the coming years and the Government will continue to support the designated airports in potential changes to operational procedures that could offer noise benefits in the future.

Other Alternatives

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 achieve the environmental objective.

It is however customary in impact assessments to consider whether there are any measures which could be taken as an alternative. The Government is currently consulting on the possibility for restrictions to be decided in the future by an alternative regulatory body as per the proposals in our UK Airspace Policy consultation. However the Secretary of State is currently the competent authority for decisions on operating restrictions at these airports and any changes to the process by which these decisions are made will have to wait for the outcome of that consultation process. As explained earlier in this section, even voluntary restrictions would be caught by Regulation (EU) 598/2014 and it would not therefore be possible for these to be introduced before the current restrictions lapsed.

There are potentially other indirect means for controls to be set at these airports under existing legislation. For instance, Section 39 of the Transport Act 2000 allows the Secretary of State to give a holder of a licence to provide air-traffic control services directions:

- (a) to prevent or deal with noise, vibration, pollution or other disturbance attributable to aircraft used for the purpose of civil aviation;
- (b) to limit or mitigate the effects of such noise, vibration, pollution or disturbance.

However as with the other options above, the Government would have to consult before using any of these powers and any subsequent restrictions would still be classified as operating restrictions and subject to EU rules on their introduction. Furthermore, if these were to be successful in delivering the environmental objectives the Government has set for these airports, the Government would have to direct an air-traffic control licence holder to limit the number of flights. There would therefore be little difference between setting restrictions via this or the existing method, though the current framework provides greater certainty to stakeholders as to who is responsible for the restrictions. There is therefore no other alternative at this moment that would offer communities sufficient protection from the harmful effects of unregulated night flights before the current regime expires.

The Government also asked the CAA to update its 2013 review of the impact of environmental charges at airports, to examine how the use of these charges has evolved in recent years. The original review found that 'environmental charges are unlikely to be the decisive factor upon which airport users (airlines) base their fleet replacement decisions.' The recommendation was also made that the differentials between charges for noise categories should be increased to act as a greater encouragement to shift to quieter aircraft.

Finally, there is also the possibility that restrictions on night flights or other operating restrictions in other countries could affect the number and noise levels of arrivals and departures in the night quota period at these airports. However, given the range of locations that airlines operate to or from in the night quota period this is not a realistic approach to the regulation of night flights in the UK and would not provide certainty to either communities or industry on the number of flights that would operate or the total amount of aircraft noise that would be produced at night. Relying solely on this approach would almost certainly mean that the Government would fail to meet its stated environmental objective.

5.2 Do Nothing

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 'Do Nothing' 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 baseline scenario.

5.3 Do Minimum

For the purpose of assessing policy options, the effective 'Do Minimum' 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.

We feel that this is the most appropriate 'Do Minimum' scenario. It was considered appropriate by most consultees and also recognised by the Regulatory Policy Committee²⁰ as the appropriate 'Do Nothing' for the purposes of the Impact Assessment. It reflects 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, which could not be delivered through 'Do Minimum'. It also helps to make the IA as easily understandable as possible.

Firstly, previous legal judgments²¹ 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.

Secondly, 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.

While we are using this scenario as the 'Do Minimum' option for our analysis due to the lack of viability of a 'Do Minimum' scenario, we do not believe continuing the current regime in its existing form is appropriate at this time. The rationale that the previous regime was set under is no longer valid due to the Government's announcement of a preferred scheme for increasing 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. We received feedback from affected populations around the airports stressing this point.

²⁰ Regulatory Policy Committee Case Histories December 2016. Available at <http://regulatorypolicycommittee.weebly.com/case-histories.html>

²¹ *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>

5.4 Final Policy Option

5.4.1 Description of final option and rationale

As explained above, the Final Policy Option (Option 4 in this IA) involves 4 main changes, including:

- 1. Introducing a new QC category (QC/0.125) to capture aircraft between 81 and 83.9 EPNdB and ensuring all aircraft quieter than this are counted within an airport's movement limits while remaining exempt from the noise quota limits.**

Most responses to our consultation agreed with these changes. It was generally regarded that these changes would make the system more transparent and communities in particular felt all aircraft they heard could cause disturbance, regardless of their noise rating.

Most industry responses too agreed that there was an argument for including these aircraft within the movements for the sake of transparency. Many however challenged the scientific evidence to justify a new QC category and argued that 'moving the goalposts' could have unintended consequences.

After the consultation had ended, there were also representations from the business and general aviation community about the impact this would have on their ability to use the London airports. However no evidence was provided in time to inform this impact assessment that would enable us to estimate the impact on this group of stakeholders. There were calls from the business aviation community to ensure that if these changes were made, the existing movement usage by these operators should be 'grandfathered'. However, the government has no powers to determine which operators an airport's available capacity is assigned to. Our changes would not prevent these operations from operating during the night quota period and there are already other non-scheduled aircraft which are not currently exempt that count towards both an airport's movement and noise quota limits. In this regard the government would expect business aviation operators and representatives of other non-scheduled services that operate at Stansted to continue to work with the designated slot co-ordinator and the airport operator to determine their operations during the night quota period.

As explained in Sections 6 and 7, these aircraft can still expose affected communities to noise levels that the WHO identify as being capable of causing sleep disturbance and it is therefore right that they are treated in a proportionate way to other aircraft. Extending the QC scale downwards by a further 3dB band to introduce a new QC/0.125 ('QC eighth') category, consistent with the fact that a 3dB increase represents a doubling of noise energy, would help prevent a proliferation of exempt aircraft and also provide incentives for the use of even quieter aircraft at night (below 81 EPNdB).

Following publication of our consultation, some issues were raised about the effect our proposed changes would have on the small number of instrument landing system (ILS) calibration flights and on other light prop movements that take place in the night quota period. ILS calibration flights are carried out to ensure that the ILS is functioning properly and currently, any landings or take offs by ILS calibration aircraft that are classified QC/0 are exempt from the restrictions. Following consideration of this matter, we have decided that all flights that are required for essential airport safety checks should continue to be exempt from the restrictions and should not count towards the movement limits.

With regards to light prop movements in general, there is no formal process for classifying these types of aircraft. The reason for this is twofold. Firstly, the noise certification levels of these aircraft

can differ due to the different test demonstration procedures required by the older ICAO Chapter 6 and current Chapter 10 standards, and this can alter the assigned QC classification. Secondly, the Chapter 6 and Chapter 10 noise levels are L_{max} values measured in A-weighted decibels (dBA) whereas the metric used for the QC classification scheme is Effective Perceived Noise Decibels (EPNdB), since it was designed to be compatible with the Chapter 3 noise standard that applies to jet and large propeller-driven aircraft (which is measured in EPNdB). There is no straightforward way of accounting for both of these factors and although the CAA has to date taken a pragmatic approach and based the classifications for light props on their unadjusted dBA levels, this can lead to inconsistent classifications.

Given the small number of these aircraft in operation (see Figure 8 below), the Government does not believe it is proportionate to devise a separate classification system, but we do want to ensure these aircraft are treated consistently under the restrictions. We have therefore decided that while these aircraft should count to the movement limits under the restrictions, they should remain exempt from the QC limits. Light propeller-driven aircraft certificated to Chapter 6 or Chapter 10 will now fall outside the scope of the QC classification scheme.

The small number of both types of these movements means the impact of these exclusions are of a very small magnitude and it has been deemed proportionate to not include these in the quantitative analysis in this impact assessment.

Figure 8 – Number of light prop movements during the night quota period in winter 2015/16 and summer 2016

LHR	LGW	STN
2	18	46

2. Adjusting Stansted’s movement limits by 1700 movements (1100 in Summer and 600 in Winter) to reflect that exempt aircraft will now count towards these limits.

More people disagreed than agreed with this proposal in our consultation, with responses from communities suggesting that there was already too much night time activity and that the number of flights should be reduced. The Government continues to consider that this is the correct approach as without this adjustment Stansted would not be able to accommodate the activity that is already taking place. This adjustment is therefore necessary to ensure that the existing benefits of night flights are maintained, as per our environmental objective. The number of currently exempt movements is much smaller at Heathrow and Gatwick and adjustments are therefore not needed to achieve the environmental objective.

3. Reducing noise quota limits at Heathrow and Gatwick to a level based on the average noise of an aircraft – our methodology for calculating this is explained further in Section 5.4.2.

Significantly more responses to our consultation agreed than disagreed with our proposals for noise quotas in our consultation, which were to reduce noise quota usage to a level based on current usage as a starting point, before looking at what further reductions could be made. Some communities emphasised we should go further, as for instance, the proposed limit for Gatwick in the winter was significantly above their usage due to the existing spare movement capacity. Most

industry responses argued that even the minimum changes we were proposing, that would prevent an average aircraft from getting louder than at present if an airport wanted to maximise their movement limits, were too severe and would have unintended consequences. Arguments for this included; that there needed to be operational flexibility for airlines to change the type of aircraft that were used on individual routes which could potentially result in larger and noisier aircraft, that airlines fleet plans were based on long term views and the five year horizon of the regime would not be able to incentivise changes, and that removing all headroom could disincentivise further reductions in noise as airlines would not expect to benefit from these in the future. Despite the concerns raised by industry, the government has received no evidence to suggest that reducing limits at Heathrow and Gatwick to reflect current noise quota usage would not be achievable. We therefore continue to think it is appropriate to make these changes to ensure that the benefits that have resulted from quieter aircraft over recent years are locked in, and give confidence to communities that the average noise from an aircraft will not increase compared to current levels.

While we have decided to go ahead with these reductions, after receiving feedback from stakeholders as part of the consultation, there was insufficient evidence to suggest that Option 4b (reducing noise quotas above and beyond current usage, for example a hypothetical 20% further reduction) as proposed in the consultation stage impact assessment was achievable without impacting airlines and airports significantly. For such changes to be achievable, there would need to be significant changes in the fleet over the course of the next regime to reduce the QC level to these levels. Due to the long timeframes associated with ordering new aircraft, the retirement ages of current aircraft in the fleet mix, and the available technology, this level of reduction (e.g. 20%) would not be achievable over the five year regime. It is also not possible to simply extrapolate based on previous trends as fleet mix changes are not linear (particular carriers tend to replace a large number of their fleet in one go e.g. there have been major changes to fleet at British Airways between 2006 and 2017). As a result, we requested evidence through our consultation on the anticipated fleet mixes of airlines in coming years to inform what would be realistic reductions in noise quotas at Heathrow and Gatwick. Based on the evidence received, we are not able to guarantee with any certainty whether further reductions in the noise quota limits beyond those based on current QC usage would be achievable without significant and prohibitive costs being incurred. As a result, in order to meet the environmental objective and maintain the existing benefits of night flights, including 'locking in' any technological improvements that have already been made to aircraft, we have decided to reduce the noise quota limits to a value based on how much noise the aircraft using the airports currently produce.

5.4.2 Implementation of changes

While we have decided that the above changes should go ahead, we have also decided however that some of these should be delayed until the second year of the regime (October 2018). Given that our proposals on changes to the night flight restrictions came after the point at which airlines would begin planning their schedules, it has not been possible for them to do so with certainty of what exact restrictions will be in place. In order to maintain the existing benefits of night flights we want to ensure that airlines have sufficient time to adapt how their fleets are utilised and plan their schedules accordingly and we therefore propose some aspects of our changes are delayed until the winter 2018 season.

As a result, for the first year of the regime, the only changes will be that all aircraft less than 84 EPNdB will count towards an airport's movement limits and Stansted's movement limit will be adjusted

accordingly. All aircraft below 84 EPNdB will remain exempt from the noise quota limits until October 2018 (i.e. they will stay QC/0 while counting towards movement limits).

From October 2018, those aircraft between 81 and 83.9 EPNdB will be included within a new QC/0.125 category while those aircraft and aircraft quieter than this will continue to count towards the movement limits. From October 2018, noise quota limits at Heathrow and Gatwick will also be reduced to a level based on the average noise of aircraft currently used at those airports. Delaying these changes until October 2018 will ensure airports and airlines have time to adapt their operations to ensure they can accommodate all of their existing planned flights within the new stricter noise limits.

The new noise limits are set out in Figure 9. The noise limits will be 1,785 (an 11% reduction from the existing limit) in winter and 5,150 (17% reduction) in summer at Gatwick, and 2,415 (41% reduction) in winter and 2,735 (46% reduction) in summer at Heathrow. These noise limits are marginally higher (i.e. the reductions are slightly lower) than those proposed in our consultation (these were 17% and 21% reductions for winter and summer respectively at Gatwick, and 43% and 50% reductions for Heathrow). This is because in response to feedback received through our consultation, we have reviewed the methodology for calculating these reductions. The intention behind these reductions remains the same however, namely to prevent the average noise from aircraft from becoming any louder than at present if an airport wanted to maximise their movement limits.

Figure 9 – Comparison of proposed and final noise reductions

	Season	Current QC Limit	Consultation proposal (% reduction)	Final (% reduction)
Heathrow	Winter	4080	2340 (-43%)	2415 (-41%)
	Summer	5100	2540 (-50%)	2735 (-46%)
Gatwick	Winter	2000	1655 (-17%)	1785 (-11%)
	Summer	6200	4870 (-21%)	5150 (-17%)

Our previous approach outlined in the consultation stage impact assessment used an average QC to calculate noise quota limits based on the QC per movement of aircraft that operated in the most recent year of data available at the time (winter 15/16 and summer 16). Our new approach, which considers feedback received as part of the consultation, calculates limits using the average scheduled QC per movement over part of the current regime – the three years between winter 14/15 and summer 17. Having considered different methodologies for calculating these reductions and consultation responses, theoretically this is the most appropriate methodology to use because:

- Using three years' worth of data means that we can be more certain that any proposed limits are not based on an unrepresentative year. Industry responses to our consultation suggested that one year of data was not an appropriate methodology for basing limits on

because the aircraft used in our chosen year for analysis may not be representative of aircraft used in other years which could be used over the course of the next regime;

- The purpose of the restrictions are to incentivise airlines to use the quietest aircraft available so our decisions on noise quotas should therefore be based on the aircraft they actually plan to operate. Scheduled data is therefore preferable. A number of consultation responses mentioned that the quota reduction should be based on scheduled as opposed to actual flight data for such reasons;
- Whilst we do not have data of aircraft that will operate in the entire current summer 2017 season, we do have scheduled data which allows us to consider the most recent aircraft that are likely to be operating just before the regime starts.

6 Costs and Benefits Overview

As well as creating noise and other negative impacts, night flights also bring a number of benefits. To better understand these impacts, the Department for Transport published the Night Flights Evidence review²², in Night Flying Restrictions at Heathrow, Gatwick and Stansted (2013)²² which analysed the types of costs and benefits that may be generated by night flights. These impacts include a range of costs and benefits, as outlined below.

Costs:

- Noise
- Air quality
- Climate change (including impacts on CO₂ emissions)

Economic benefits to:

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

In addition, the Department for Transport held focus groups in June 2016 with industry and community stakeholders and also sought additional evidence as part of the consultation. The papers issued for these events were published alongside our consultation.

The available evidence on the costs and benefits of night flights is summarised in Section 6.1 and Section 6.2 below respectively. As at consultation stage, we have taken a proportionate approach to assessing the impacts of the policy options under consideration on these costs and benefits. As a result we have only monetised the change in the value of the impact of night noise on sleep disturbance, the direct costs to business and the impacts on the public accounts.

In addition, having taken on board requests made in consultation responses, we have provided illustrative estimates of the total change in the value of the other impacts of night noise on health where possible to illustrate the **potential scale of these impacts**. However, as discussed below, the Department's Transport Analysis Guidance²³ does not contain an approved methodology for

²² 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

²³ 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>

estimating these impacts. For this reason, whilst we have provided estimates to illustrate the **potential scale of these impacts**, we have not included these in the net present value calculation.

In addition, at consultation stage we welcomed further evidence from stakeholders on the impacts of the policy options under consideration. We have considered all the responses we received and have incorporated relevant and robust evidence in to the analysis below.

6.1 Evidence on costs of night flights

This section summarises the available evidence, taking on board those submitted during the consultation and at focus groups, on the costs of night flights. For all of these costs, it is expected that more flights would lead to an increase in costs, and fewer flights would lead to a reduction in these costs.

6.1.1 Noise impacts: Sleep disturbance

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. In particular night noise can affect the number of awakenings, the time spent in different stages of sleep and also the quality of sleep. 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 Europe²⁴. These state that between 40 to 55dB $L_{Aeq\ 8\ hour}$ ²⁵, 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 noise levels in the WHO guidelines do not refer solely to aviation however, and are based on the level of outside noise from all sources – including other modes of transport. The WHO is expected to shortly publish new guidelines for noise and it is possible these may include specific guidelines for different sources, though at the time of writing no specific details are known²⁶. Since we have been unable to complete analysis below 48 dB $L_{Aeq\ 6.5hr}$, for the reasons outlined in Section 7.2, we have not monetised the benefits of the changes to all exposed populations.

When the night flight restrictions were reviewed in 2013, we acknowledged 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 review²⁷ 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 night flights was regarded as a health effect in its own right with a measurable impact on quality of life.

In contrast, we have reviewed various studies received as part of the consultation that found the impact night flights have on sleep is minimal. This includes the July (2014) paper published by the German Aerospace Centre, Effects of Nocturnal Aircraft Noise. We have reviewed these studies and concluded that night flights do have an impact on the quality of sleep of local communities and therefore this impact should be quantified. We have therefore monetised the change in the value of the impacts of night flights on sleep disturbance in the night quota period in this impact assessment

²⁴ World Health Organization (2009) 'Night Noise Guidelines for Europe'
http://www.euro.who.int/__data/assets/pdf_file/0017/43316/E92845.pdf

²⁵ $L_{Aeq\ 8\ hour}$: equivalent continuous noise level over the 8 hour night period.

²⁶ There is the possibility these guidelines will be published before this Impact Assessment is published, but due legal deadlines and the time required for necessary clearances we have not been able to delay the analysis and wait for these.

²⁷ 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>

using an approach consistent with the CAA's review (see Section 7.3 for a full description of the methodology and key limitations of this analysis) to give an estimate of the impact of our proposals on this. Although new studies have been produced to estimate the impact of noise on sleep disturbance, the approach we have used still remains the most applicable and robust approach for estimating the impact of aviation night noise.

6.1.2 Noise impacts: Other Health impacts

There has been growing research on the link between exposure to aircraft noise and health impacts over the years. For example, the NORAH (Noise-Related Annoyance, Cognition, and Health) study²⁸, studied the impact of aviation noise (and noise from other transport modes) on health (including cardiovascular disorders), blood pressure and sleep, among other factors.

The CAA's review, mentioned above, also found evidence that night noise exposure (above 55 dB L_{Aeq,8hr} night) results in increased risk of myocardial infarctions (heart attacks) and proposed an approach for monetising this.

In addition, there has also been other evidence showing a correlation between noise exposure from night flights and hypertension, which can lead to an increased risk of stroke or dementia. This correlation is from long-term exposure to night noise, for people repeatedly experiencing the immediate stress responses of sleep disturbance²⁹.

It is worth noting the impacts mentioned could have distributional impacts as they could be more likely to affect certain vulnerable members of society that may be more sensitive to noise, such as the elderly or those suffering from mental health issues. See Section 11.3 for further details.

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

The Aviation Environment Federation (AEF) last year also published a paper³⁰ which synthesised the latest evidence and analysed the Government's current policy with regards to aviation noise.

Given the demand that has been expressed through consultation responses and discussions with stakeholders for these other health impacts to be quantified, we have provided illustrative estimates of the change in the value of the other impacts of night noise on health as a result of our proposals where possible using methodologies for assessing the impacts of changes in daytime noise (see Section 7.4 for details of the methodology used) to illustrate the **potential scale of these impacts**. However, the Department's Transport Analysis Guidance³¹ does not contain an approved methodology for estimating the change in the value of the other impacts of night noise on health. For this reason, whilst we have provided estimates to illustrate the **potential scale of these impacts**, we have not included these estimates in the net present value calculation. These health impacts included covers AMI (acute myocardial infarction), stroke and dementia. The monetised estimates of the impact of a change in noise on these health impacts could be an underestimate since the methodology uses daytime noise effects to make estimates.

It should be noted that these figures cannot be used to represent the value the government places on the impacts of these health conditions to individuals or society. This impact assessment solely

²⁸ NORAH Knowledge No. 5 and No. 10, <http://www.laermstudie.de/en/>

²⁹ 'Hypertension and Exposure to Noise near Airports (HYENA) Study' by Larup et al (2007) & Babisch and van Kamp (2009)

³⁰ Aviation Environment Federation (AEF) (2016) 'Aircraft Noise and Public Health - The evidence is loud and clear', Commissioned by HACAN and the Aviation Environment Trust

³¹ 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>

covers the potential scale of these impacts as a result of the changes in noise impacts of our final policy option i.e. compared with a baseline in which the current regime continues, hence these impact may be smaller than stakeholders might expect.

6.1.3 Noise impacts: Other impacts

For next day effects, there is some evidence to suggest that the night noise resulting from night 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 and productivity of individuals the next day.

In relation to the impact on children, the evidence on the impact of these flights is also inconclusive. There has been a growing amount of research, including from the NORAH study previously mentioned and the RANCH (Road traffic and Aircraft Noise and children's Cognition and Health) study³², that noise exposure from aircraft has an effect on cognitive development (particularly on reading and memory skills) and chronic noise may affect children's stress levels, blood pressure and mental health. There is also evidence to suggest that aircraft noise may be associated with poorer reading comprehension and recognition memory. However, it is unclear whether the effects are attributable to daytime or night time aircraft noise, and there is no evidence for long-term persistent effects on cognitive development. The Department's Transport Analysis Guidance³³ also does not specify an approach for analysing situations where noise impacts on potentially noise sensitive groups, such as schools.

Other recent evidence includes a review³⁴ by Dr Charlotte Clark from Queen Mary University of London, which was undertaken for the Airports Commission. This concluded that there is increasing evidence on adverse health effects to support the use of prevention measures such as insulation, preventative policy, 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.

6.1.4 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 fewer 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 lower 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. We received no consultation responses or evidence to counter this approach, which was also taken at consultation stage.

6.1.5 Climate Change

Aviation's most significant contribution to climate change is through emissions of carbon dioxide (CO₂). The sector's share of the UK's overall greenhouse gas emissions has been increasing and is

³² Aircraft and road traffic noise and children's cognition and health: a cross-national study. RANCH study team. 2005

³³ 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>

³⁴ 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

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. We received no consultation responses or evidence to counter this approach, which was also taken at consultation stage.

6.2 Evidence on the benefits of Night Flights

This section discusses 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. None of the impacts of the policy options under consideration at consultation-stage on these benefits were monetised in our consultation-stage IA. However, in this final-stage impact assessment, the direct impacts of our proposals on airlines and airports, and the impacts of our proposals on the public accounts, have been separately monetised (see Section 0 for a detailed description of the methodology we have used to do this).

6.2.1 Airlines and airports

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, maintenance, 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 2014/15³⁵, 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. Some responses from the consultation stated that a reduction in the ability of low cost carriers to operate a minimum number of rotations per day could make the current business models of some airlines unviable. Placing too large a constraint on night flights could reduce the ability for these airlines to operate viable schedules and could lead to airlines choosing to base their aircraft elsewhere.

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.

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.

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, Titan 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.

³⁵ 2014/15 is the latest full season for which the Department has full data at this level of detail. Based on DfT analysis of CAA Statistics, 2017.

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.

6.2.2 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. The Airports Commission's Final Report³⁶ highlighted that arrivals at Heathrow before 6:00am 'are broadly used to support connectivity to high value long-haul destinations', such as Hong Kong or Singapore. For example, in 2014, over half of the capacity for arrivals from Hong Kong and Singapore are scheduled during the 6.5 hour night quota period.³⁷

6.2.3 Public Accounts

Night flights can affect the public accounts directly, through the tax receipts from taxes directly levied on aviation. They can also affect the public accounts indirectly, by altering indirect taxation receipts from goods consumed across the rest of the economy. For example, the APD paid by UK-resident leisure passengers travelling on night flights reduces the amount of income these leisure passengers have to spend on other goods and services in the UK economy, thereby affecting indirect tax revenues. In the leisure market, the direct and indirect public account affects therefore partially offset each other.

6.2.4 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 debate³⁸. 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 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. Therefore 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 2010.³⁹ Firms pay a premium to use these

³⁶ Airports Commissions: Final Report, July 2015. Available at

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/440316/airports-commission-final-report.pdf

³⁷ CAA analysis of OAG data. This data includes flights with more than 10,000 seats annual scheduled capacity only. OAG data includes passenger flights only.

³⁸ 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>;

³⁹ Taken from consultation response to DfT from the Association of International Courier and Express Services (2016)

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 unavailable⁴⁰, 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, therefore 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.

6.2.5 Airline and Passenger Responses

At consultation stage we identified a wide variety of potential passenger and airline responses to the policy options under consideration. These indicated that how passengers and airlines responded would have an important influence on the impacts of the policy options under consideration. 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. As part of the consultation we welcomed any evidence from stakeholders on the likely responses of airlines and passengers to the policy options under consideration. There has been no substantial or robust evidence to suggest what the most appropriate airline and passenger response would be, but several indicated that rescheduling flights would be extremely difficult for a number of reasons, including limited day time slot availability.

6.2.6 Consumer Choice and competition

It is likely that when there are more slots available, there is a wider range of options for consumers regarding choice of destination and flight times. Plus, as mentioned in Section 6.2.1, if a reduction in the number of flights meant that an airline's business model is no longer viable, there could be a reduction in the provision of low-cost flights at these airports. This could impact upon consumer choice if certain destinations or flight times were no longer available from these airports. Given the existing capacity constraints within the south east, there is limited scope for existing night flights to be retimed to other parts of the day, meaning that a very large reduction or a night flight ban could have a material impact on choice for customers of low-cost airlines.

Since there has been no substantial or robust evidence to suggest what the most appropriate airline and passenger response would be to reductions in the number of night flights, it is not possible to quantify and monetise the impacts on consumer choice and competition.

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 four key parts.

1. Estimating the number of night flights that would occur in the night quota period at each airport under the Do Minimum scenario and the policy option.
2. Estimating the number of people affected by night noise in the night quota period at each airport under the Do Minimum scenario and the policy option.

⁴⁰ 'The Economic Impact of Express Carriers for UK plc' by The Aviation and Travel Consultancy and Oxford Economic Forecasting, (June 2002)

3. Estimating the value of the impact of night noise changes on sleep disturbance (and other health impacts) in the night quota period at each airport for the policy option compared to the Do Minimum scenario.
4. Estimating the value of the economic impacts of a change in the number of flights in the night quota period for the policy option compared to the Do Minimum scenario, specifically the direct impacts on airlines and airports, and the impacts on the public accounts, which are estimated separately.

The analysis has a number of limitations, which means that the results of the quantitative analysis 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. .

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

For any estimates presented in present value terms, the present value base year is 2017. All monetary estimates produced by this analysis are presented in constant prices and have a price base year of 2015. The appraisal period is 5 years, since the policy only exists for this time period. Where relevant, the discount rate is 3.5% per year over this period. This is consistent with the guidance in the Better Regulation Framework Manual.

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 Minimum scenario and the policy option, the Department has developed a suite of spreadsheet models. For each scenario, these models 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 Minimum scenario, the final policy option and the other policy options considered are presented in Appendix C.

In addition, the models produced can provide more disaggregated outputs. We have therefore used them to estimate the total number of movements in the night quota period at each airport in the first and last years of the next night flights regime (2017/18 and 2021/22) by aircraft type. This information was provided to the CAA in order to estimate the number of people affected by night noise where relevant.

7.1.2 Approach

The first stage of the 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 the analysis is CAA data on air transport movements during the night quota period at each airport in the 2015/16 winter and 2016 summer seasons. Included in this data is the type of aircraft and the QC assigned to each movement;

- Assumptions about the future growth of night flights in the Night Quota Period (NQP) at each airport in each year of the next night flights regime in the absence of any night flight restrictions have been made based on information from or discussion with each of the airports. These are then used to estimate the total number of movements during the night quota period;
- Use DfT model to estimate the future fleet mix used during the NQP 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 then used to estimate total QC in each year of the next night flights regime.

The second stage of the 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 to 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.

The 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 2015/16 winter and 2016 summer seasons, which was the latest full year of 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, 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 2015/16.

- Where possible, we used the average quota count for that aircraft type for that specific airport and split by arrivals and departures using CAA's data for the 2015/16 winter and 2016 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 at a different airport), then a standard set of QC assumptions were used based on the average QC across all three airports but split between arrivals and departures; and
- Where an aircraft type was not used for any arrival or departures in the 2015/16 winter and 2016 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 further details of the DfT Fleet Mix Modelling in order to understand composition of future aircraft types and their impact on future quota count usage at each airport during the years of the night flights regime.

Using winter 2015/16 and summer 2016 data supplied to us by the CAA on night flight movements described in Section 7.1.3, we have undertaken a bespoke fleet modelling exercise as part of our aviation modelling framework to forecast the future composition of night flights at each of the three airports. The data received from the CAA was further processed to remove air traffic movements deemed insignificant for the purpose of this exercise.

The model estimates the proportions of night flights being carried out 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 35 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 carrier 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, including incorporating evidence received through the consultation. 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 amount of night flights, this analysis may 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 worldwide service in January 2016. We estimate that easyJet accounted for around 72% of all night-time Airbus A320 movements at Gatwick in 2015/16⁴¹ 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 2021/22⁴². 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. This means, in our Do Minimum 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 Minimum scenario represent an underestimate of the night noise under a continuation of the current regime scenario. Consultation evidence from airlines confirmed that more of these new aircraft types such as the A320neo and the Boeing 737 Max are going to be introduced into the fleet over the course of the next regime. Some stakeholders provided detail on how they plan on introducing these aircraft into their fleets, which has been incorporated into the DfT fleet mix model.

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, meaning it was a challenge to draw up the new supply pools to include in this model. This means 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 35 years for freighters, which has been assumed for the purposes of this analysis and was confirmed through discussions with industry.

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 each 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 rate forecasts on their forecast movements for the coming years⁴³. The impact assessment 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 impact assessment.

⁴¹ DfT analysis of CAA Statistics, 2017

⁴² CAA Data

⁴³ ICF. Night Jet Movement Consultation Support, Commissioned by Gatwick Airport Limited. 2016

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 impact assessment, this could potentially significantly alter the impacts of the policy options that have been estimated. In particular, if our assumptions overestimate the growth in night flights, this could reduce the impacts 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

In 2016, the CAA published a paper, 'Aircraft noise and health effects: Recent findings'⁴⁴ which examines evidence on the relationship between aircraft noise and health that has been published since 2009. The report concluded that with regards to night noise, sleep disturbance and health impacts, there has been growing recognition that average indicators, such as L_{night} , are insufficient to fully predict sleep disturbance, sleep quality and impact on health; this was also emphasised in numerous consultation responses we received and highlights the uncertainty around the monetisation of impacts of changes to the night flights regime. At this time, however, no alternative metrics exist that can be monetised and no robust alternative that could be applied to estimate the impacts of the regime were submitted as part of the consultation. Given these limitations, to supplement the monetised estimates, changes in the number of flights and quota usage are also presented with the assessment of the policy options.

Some consultation responses requested for impacts to be modelled at contours below 48 dB $L_{Aeq\ 6.5hr}$. We are unable to produce contour maps below 48 dB $L_{Aeq\ 6.5hr}$ however as it becomes more difficult to measure aircraft noise levels at these greater distances from airports. The reason for this is that at these distances, aircraft noise levels are much closer to those of other noise sources. Since the CAA use real measurements to validate their noise model (ANCON model, see below) that is used to create noise contours, the ability to validate the model reduces with increased distance, leading to increased uncertainty in the position of the contours lines. There is also greater variability in the position of aircraft at these distances from the airport, which further increases the uncertainty of the noise from an individual aircraft at a specific location.

As a means of comparison between options however, it is possible to monetise the impacts on communities down to 45dB $L_{Aeq\ 6.5hr}$ and this has been carried out as part of this assessment. This lower level contour is relevant only for sleep disturbance based on the dose-response function. Current evidence which informs the Department for Transport's noise assessment methodology assumes that health impacts on stroke and dementia are only expected to occur from 50dB $L_{Aeq\ 6.5hr}$ and on acute myocardial infarctions (AMI) from 58dB $L_{Aeq\ 6.5hr}$ based on dose-response functions – both adapt day-time noise impacts to night time noise impacts for the purposes of this impact assessment (see Section 7.4 for more details).⁴⁵

The level of 40dB L_{night} , which many consultation responses referred to as the necessary level for analysing impacts, is the level at which the World Health Organization states adverse health effects can be observed in the exposed population. There is however no recommendation (by the WHO) for noise contours to be produced to this level. It is also worth noting that whilst some adverse effects can be observed as low as 40dB L_{night} , exposure levels below 45dB L_{night} were subsequently excluded

⁴⁴ Civil Aviation Authority. Aircraft noise and health effects: Recent findings. March 2016
<http://publicapps.caa.co.uk/docs/33/CAP%201278%20MAR16.pdf>

⁴⁵ 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>

from the WHO analyses that contributed to the exposure-response relationships in the WHO's 2011 'Burden of disease from environmental noise'. The reason for this was because 'the assessment of those noise levels was relatively inaccurate and other sources may be more important in situations with these low levels'.

All estimates of the number of people affected by night noise in the night quota period at each airport under the Do Minimum scenario and the other policy options were produced by the Civil Aviation Authority (CAA) and comply with the requirements on noise mapping under the rules governing the introduction of operating restrictions. It is worth noting we assume a fixed number of households in a contour over time i.e. no population growth, as recommended in the Department's Transport Analysis Guidance⁴⁶. The estimates of the number of people affected were generated 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 and which the Department's Transport Analysis Guidance⁴⁷ suggest is most appropriate for modelling the impacts of aviation noise. ANCON is fully compliant with the latest international guidance on noise modelling from ECAC (ECAC.CEAC Doc 29 (4th edition), published in December 2016)⁴⁸ and ICAO (ICAO Doc. 9911, published 2008)⁴⁹. These guidance documents represent internationally agreed best practice as implemented in modern aircraft noise models. However, since the DfT's analysis is used as an input to ANCON, the results are also subject to the limitations described above on the models in Section 7.1.

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 impact assessment, 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 Environmental Research and Consultancy Department (ERCD) Report 1209⁵⁰.

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 $LA_{\text{eq}, 6.5 \text{ hour}}$ 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 $LA_{\text{eq}, 6.5 \text{ hour}}$ 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 $LA_{\text{eq}, 6.5 \text{ hour}}$ night period could be substituted for 8 hour L_{night} data as required without further adjustment. We have therefore adopted this approach in this impact assessment. However, to the extent that there are any

⁴⁶ 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>

⁴⁷ 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>

⁴⁸ European Civil Aviation Conference. Report on Standard Method of Computing Noise Contours around Civil Airports ECAC.CEAC Doc 29, 4th edition, Volumes 1 & 2, December 2016

⁴⁹ International Civil Aviation Organization (ICAO): Recommended Method for Computing Noise Contours Around Airports. ICAO Doc 9911, 1st Edition (2008)

⁵⁰ ERCD Report 1209: Proposed methodology for estimating the cost of sleep disturbance from aircraft noise, January 2013.
<https://publicapps.caa.co.uk/modalapplication.aspx?catid=1&pagetype=65&appid=11&mode=detail&id=5361>

differences in the dose-response functions⁵¹ between the LA_{eq, 6.5 hour} night and periods in practice, this would introduce uncertainty surrounding the results of this analysis.

An alternative to using LA_{eq, 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 LA_{eq, 6.5 hour} night period. This 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 LA_{eq, 6.5 hour} night noise exposure results directly. Therefore we have used the LA_{eq, 6.5 hour} night approach, but any monetised noise estimates in this impact assessment could be considered to be an underestimate of the actual impact since, typically, a LA_{eq, 6.5 hour} night level is slightly lower than an 8 hour L_{night} level at a given location around an airport⁵².

Given the size of the expected impacts for these policy scenarios, to keep the analysis proportionate, the noise impact analysis described in Section 8 has only been undertaken using the ANCON model for the first and the last years of the next night flights regime, 2017/18 and 2021/22. For the years modelled, 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.

Monetary valuation of changes in noise is based on estimation of the number of Disability-Adjusted Life Years (DALYs) lost (or gained) under each scenario, assuming a value of £60,000 per DALY. This valuation is based on the recommendations of the study: Environmental noise: Valuing impacts on: sleep disturbance, annoyance, hypertension, productivity and quiet (Defra, 2014)⁵³ and their accompanying noise modelling tool. More detail on the derivation of the values and underlying research is given in that report.

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 Minimum scenario⁵⁴. 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 has not been possible to predict the time to which a flight is rescheduled or if it would be cancelled using our available evidence base at this time. Whilst we sought additional evidence as part of the consultation to facilitate this, we did not receive any robust evidence to inform what would happen to noise impacts outside the night quota period.

⁵¹ A dose response function describes, at different noise levels, the proportion of the population affected (for sleep disturbance) or the increased risk of adverse health outcomes (for AMI, stroke and dementia).

⁵² In addition, these estimates do not cover flights that would be granted dispensations (see Section 1.1 for more details on such flights).

⁵³ Available at http://www.programmeofficers.co.uk/Cuadrilla/Inquiry/CUA/CUA_INQ14.pdf

⁵⁴ Given that there are changes to the quota count system under our proposals, for the purposes of this interpolation, the change in noise quota usage in each year under our proposals in comparison to the Do Minimum scenario has been calculated on a consistent basis by calculating the change in noise quota usage as a result of the estimated change in the number of flights in the NQP under our proposals based on the QC that aircraft would be assigned under the Do Minimum scenario.

7.4 Estimating the scale of other noise impacts on health

At consultation stage, we did not estimate the value of any other impacts of night noise on health since the Department's Transport Analysis Guidance⁵⁵ does not include an approved method for the monetisation of the risk of myocardial infarctions, stroke or dementia for noise at night. However, consultation responses from communities and local authorities and discussions with stakeholders stated that excluding these resulted in an underestimate of the health impacts associated with night noise.

In response, we have therefore provided illustrative estimates of the change in the value of these other health impacts of night noise to illustrate the **potential scale of these impacts**. As there is no approved methodology for estimating changes in the risk of these health outcomes as a result of night noise exposure, we have assessed it using the approved methodology for day time noise. This approach has been agreed by the CAA. Given that night noise levels are generally lower however, the results of this monetisation are small and are likely an underestimate of costs associated with changes in night noise. These estimates may also appear small given our approach illustrates the scale of impact of a change in policy **relative** to the current regime. Given these reasons we have combined the results of the monetisation of these impacts when assessing the impact of different policy options.

These illustrative estimates of the change in the value of the other impacts of night noise on health as a result of our proposals were estimated using methodologies in the Department's Transport Analysis Guidance for assessing the impacts of changes in daytime noise. This methodology was implemented based on a similar approach as for estimating sleep disturbance impacts. For the years modelled using the CAA's ANCON model (2017/18 and 2021/22), we have used the results of the ANCON modelling directly to estimate the monetary value of these impacts; and for other years, we have adopted the same simplified approach as for the sleep disturbance impacts and interpolated the monetary value of the impacts for the intervening years using the 2017/18 and 2021/22 results (see Section 7.3 for further details).

Whilst we have provided estimates to illustrate the **potential scale of these impacts**, we have not included these estimates in the net present value calculation given the limitations in the methodology described above.

7.5 Estimating the value of the economic impacts of a change in the number of flights in the night quota period

In order to inform this impact assessment, the Department commissioned SYSTRA to undertake a research project to improve our ability to estimate the economic impacts of potential changes to the night flights regime. A report outlining the methodology and findings of this research project will be published shortly, alongside an independent peer review of the project by Leeds ITS. The Department has carefully considered how the findings of this research project should inform this impact assessment, and adapted the methodology developed by SYSTRA in order to separately estimate the direct impacts on airports and airlines, and the impacts on the public accounts, where the policy option under consideration changes the number of flights in the NQP at an airport in comparison to the Do Minimum scenario.

⁵⁵ 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>

The analysis of the economic impacts of a change in the number of flights in the NQP has been undertaken separately for each airport. For the purposes of this analysis, flights in the NQP at each airport have been grouped together into 'flight groups' on the basis of the following dimensions: carrier type, seat class, season (summer or winter), direction (arrival and departure) and QC. This is felt to be a proportionate level of disaggregation given the evidence available from the research project and the need to reconcile this with our analysis of the change in the number of flights in the NQP at each airport.

7.5.1 Common step

A common step for both strands of the analysis of the economic impacts of a change in the number of flights in the NQP is to aggregate the estimates of the change in the number of flights in the NQP for the policy option under consideration compared to the Do Minimum scenario, which have been estimated using the approach described in Section 7.1, into the flight groups described above.

It should be noted that the estimates of the economic impacts presented in the impact assessment are therefore sensitive to the assumptions made when estimating the change in the number of flights in the NQP.

A key example of this is that, 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 (see Section 7.1.2). In reality, this percentage would be expected to vary between different aircraft types and is subject to uncertainty. So, this is an important factor that contributes to the uncertainty around these results.

7.5.2 Impacts on business

Direct impacts

When seeking to identify the direct impacts of this measure on business, the Department has carefully considered the relevant guidance from the RPC⁵⁶ and the guidance in the Better Regulation Framework Manual. A direct impact on business is defined as "an impact that can be identified as resulting directly from the implementation or removal/simplification of the measure". Taking this into account and given the nature of the changes to the night flights restrictions that are being considered, the Department considers that only airlines and airports will be directly impacted by this measure; and that the direct impacts on airports and airlines are the impacts on their profitability that are a direct consequence of the change in the number of flights that are allowed in the NQP as a result of our proposals. Furthermore, for the purposes of this impact assessment, the Department considers that any impacts on the prices that are charged by airports and airlines, any impacts on the load factors on other flights or any rescheduling, and any knock-on impacts on business passengers should be treated as indirect impacts of this measure.

In order to estimate the direct impacts on business, the next consideration is therefore how best to estimate the impacts on airports and airlines profitability that are a direct consequence of the change in the number of flights that are allowed in the NQP under our proposals in comparison to the Do Minimum scenario. Having considered the evidence at our disposal, the Department has

⁵⁶ In particular, RPC (2016) Impact Assessment Case Histories - A practical guide on how to interpret better regulation framework principles and rules.

decided that this should be estimated for each flight group used in the analysis by multiplying the estimated average profitability for airports and airlines per flight in the NQP for each flight group, by the estimated change in the number of flights in the NQP for the policy option under consideration compared to the Do Minimum scenario for the flight group. The results are then aggregated for all flight groups to produce the estimates quoted in Section 8 of this impact assessment.

For the purposes of this impact assessment, the Department has estimated the average profitability for airlines per flight in the NQP for each flight group as the average airline operating margin per flight in the NQP for the flight group on the basis of the definition of the airline operating margin used by SYSTRA in the research project, which is reproduced below⁵⁷. The Department has estimated this using the estimates of these costs and revenues in the 2014/15 base year (in 2015 prices) included in the models developed by SYSTRA as part of the research project, which are in turn based on SYSTRA's analysis of data obtained from RDC Aviation.⁵⁸ In the absence of any robust evidence on how these revenues and costs would change in real terms over time, it has been assumed that the value of these revenues and costs would remain constant in real terms over time.

$$\text{"Airline Operating Margin} = (R_p + R_c) - C_o$$

where

R_p = Revenue from Passengers (including ancillary revenue)

R_c = Revenue from Cargo

C_o = Direct Operating Costs of the Flight"

Furthermore, for the purposes of this impact assessment, the Department has estimated the average profitability for airports per flight in the NQP for each flight group as the average airport operating margin per flight in the NQP for the flight group on the basis of the definition of the airport operating margin used by SYSTRA in the research project, which is reproduced below⁵⁹. Again, the Department has estimated this using the estimates of these costs and revenues in the 2014/15 base year (in 2015 prices) included in the models developed by SYSTRA as part of the research project, which are in turn based on SYSTRA's analysis of published airport accounts and airport charges. In the absence of any robust evidence on how these revenues and costs would change in real terms over time, it has been assumed that the value of these revenues and costs would remain constant in real terms over time.

$$\text{"Airport Operating Margin} = (R_{LC} + R_{TC} + R_{SP}) - C_o$$

Where

R_{LC} = Revenue from Landing Fees (levied on the airlines)

R_{TC} = Other Airport Charges (levied on airlines)

R_{SP} = Passenger Spending at the Airport

⁵⁷ The direct operating costs include fixed costs, fuel costs, airport charges and crew costs.

⁵⁸ The estimates for the 2014/15 base year included in the models developed by SYSTRA as part of the research project are further disaggregated by flight time and length of haul, so in producing these estimates, the Department has aggregated these estimates for the flight groups used in this analysis.

⁵⁹ Fixed costs are not included in this.

C_o = Operating Costs”

Where there were no flights in a given flight group in the 2014/15 base year in SYSTRA’s models and hence no estimates of these costs and revenues are available specifically for the flight group, the Department has adopted a similar approach to SYSTRA in dealing with this issue, and estimated the average profitability for airports and airlines per flight in the NQP for the flight group at a more aggregate level. In implementing this, the level of aggregation has been increased progressively by dropping one of the dimensions (in the same order as SYSTRA) until aggregated estimates of these costs and revenues are available to produce an estimate of the average profitability per flight in the NQP for the flight group as follows:

- level 1: carrier type, seat class, direction and QC (season has been dropped);
- level 2: carrier type, seat class and QC (direction has been dropped);
- level 3: seat class and QC (carrier type has been dropped); and
- level 4: QC only (seat class has been dropped).

A key exemption to this is for “non-commercial” flights, such as government flights and general aviation. SYSTRA’s models do not include any estimates for “non-commercial” flights which enable the average profitability per flight in the NQP to be estimated for these flights, and hence the Department has excluded these flights from this aspect of the analysis. Non-commercial flights make up around 1% of movements at Gatwick and Heathrow and around 8% at Stansted.

In addition, it should be noted that the estimated average profitability for airports and / or airlines per flight in the NQP for a flight group is negative in some cases. That is, it is estimated that costs are greater than revenues for airports and / or airlines on the basis of the estimates included in SYSTRA’s models. Where this is the case, the Department has taken a conservative approach in this analysis, and set the average profitability for airports and / or airlines per flight in the NQP for the flight group to zero. This is conservative because it has the effect of increasing costs.

Finally, it should be noted that the estimates generated by this approach are sensitive to the inputs that have been used (particularly the estimates of costs and revenues in the 2014/15 base year (in 2015 prices) included in the models developed by SYSTRA as part of the research project), the assumptions described above and the other methodological choices that have been made. Therefore, the estimates of the direct impacts on airports and airlines presented in the impact assessment are subject to considerable uncertainty. Nevertheless, given the scale of the changes to the night flights regime under consideration and the evidence at our disposal, the Department considers that the approach taken is a proportionate approach for estimating these impacts in Section 8, and for estimating the equivalent annual net direct cost to business (EANDCB) in Section 10.

Indirect impacts

As noted above, for the purposes of this impact assessment, the Department considers that any impacts on the prices that are charged by airports and airlines, any impacts on the load factors on other flights or any rescheduling, and any knock-on impacts on business passengers should be treated as indirect impacts of this measure. The Department has not sought to estimate the value of any of these indirect impacts of our proposals on business in this impact assessment. The reasons for this are explained below.

Firstly, regarding any impacts on the prices that are charged by airports and airlines, it should be noted that the approach used to estimate the direct costs to business above implicitly assumes that prices remain the same under the policy option as under the Do Minimum scenario. As part of the research project, SYSTRA developed an approach for estimating how changes to the night flights regime could impact on air fares. For example, airlines may have the ability to charge higher air fares for flights in the NQP where the number of flights allowed in the NQP under the night flights regime is reduced. However, the Department considers that this aspect of SYSTRA's approach is particularly innovative. So, the Department has decided that further review would be required before making use of this in our work, and it has not therefore been utilised for the purposes of this impact assessment.

Secondly, regarding any impacts on the load factors on other flights or any rescheduling, it should be noted that the approach used to estimate the direct costs to business above implicitly assumes that load factors on both flights in the NQP and flights outside the NQP remain the same under the policy option as under the Do Minimum scenario, and also implicitly assumes that there is no rescheduling of flights. This would not necessarily be the case in practice and such indirect impacts could potentially mitigate some of the direct impacts on airports and airlines. For example, where the number of flights in the NQP allowed under the policy option is lower than under the Do Minimum scenario, it is likely that load factors on the remaining flights in the NQP or flights that take place during the day would increase as some passengers switch to travelling on these flights. However, given the limitations of our available evidence, these indirect impacts are subject to considerable uncertainty. For this reason, the Department has not sought to estimate these impacts in this impact assessment.

Thirdly, regarding any knock-on impacts on business passengers, it should be noted that a consequence of not using SYSTRA's approach for estimating how changes to the night flights regime could impact on air fares is that it has not been possible to estimate the impacts on passengers, neither leisure nor business, in this impact assessment since the approach that SYSTRA developed as part of the research project for estimating these impacts requires the change in air fares to first be estimated.

Finally, given the limitations of our available evidence base, this approach does not take account of any other potential indirect impacts that changes to the number of flights in the NQP at an airport could have on airlines and airports.

7.5.3 Public accounts

The Department considers that the direct impacts on the public accounts are the impacts on the public accounts that are a direct consequence of the change in the number of flights that are allowed in the NQP under our proposals. Following the approach taken by SYSTRA in the research project, the Department has taken into account the impacts on both Air Passenger Duty (APD) and VAT on retail purchases at the airports that arise as a direct consequence of the change in the number of flights that are allowed in the NQP. So, a first step in estimating the direct public accounts impacts is to estimate the average APD and VAT on retail purchases at the airport per flight in the NQP for each flight group.

The average APD and VAT on retail purchases at the airport per flight in the NQP for each flight group are estimated using the estimates of APD and VAT on retail purchases in the 2014/15 base year (in 2015 prices) included in the models developed by SYSTRA as part of the research project,

which are in turn based on SYSTRA’s analysis. In the absence of any robust evidence on how these values would change in real terms over time, it has been assumed that these values would remain constant in real terms over time. In addition, where there were no flights in a flight group in the 2014/15 base year in SYSTRA’s models and hence no estimates of APD and VAT on retail purchases are available specifically for the flight group, the Department has adopted the same approach as in Section 7.5.2 and estimated the average APD and VAT on retail purchases per flight in the NQP for the flight group at a more aggregate level. Finally, “non-commercial flights” are also excluded from this analysis for the same reasons outlined in Section 7.5.2.

The Department has also decided that the impact that changes to the level of tax receipts from taxes directly levied on aviation due to changes to the number of flights in the NQP can have on indirect taxation receipts from goods consumed across the rest of the economy should also be taken into account. For example, changes to the amount of APD paid by UK-resident leisure passengers affect the amount of income these passengers have to spend on other goods and services in the UK economy, thereby affecting indirect tax revenues. Drawing on the approach taken in the research project and adapting this where required, the average net impact on the public accounts per flight in the NQP taking this into account has been estimated using the following formula for each flight group:

$$(1+t) * (\text{average APD and VAT per flight in the NQP for the flight group}) - t * \%Leisure * \%UK * (\text{average APD and VAT per flight in the NQP for the flight group})$$

Where:

- *t* is the average level of indirect taxation in the economy;
- *%Leisure* is the proportion of passengers travelling for leisure; and
- *%UK* is the proportion of leisure passengers that are UK residents.

The final step is then to estimate the total impact on the public accounts under the policy option in comparison to the Do Minimum scenario for the flight group. This is estimated by multiplying the estimated change in the number of flights in the NPQ for the policy option compared to the Do Minimum scenario for the flight group, by the estimated average net impact on the public accounts per flight in the NQP for the flight group as defined above. The results are then aggregated for all flight groups to produce the estimates quoted in Section 8 of this impact assessment.

It should be noted that the estimates generated by this approach are sensitive to the inputs that have been used (particularly the estimates of APD and VAT on retail purchases in the 2014/15 base year (in 2015 prices) included in the models developed by SYSTRA as part of the research project), the assumptions described above and the other methodological choices that have been made.

In addition, it should be noted that this does not take the impact of any changes to UK-resident leisure passengers’ expenditure on aviation on the indirect taxation receipts from goods consumed across the rest of the economy into account. This is due to the uncertainty surrounding how passengers would respond to the change in the number of flights that are allowed in the NQP under our proposals; and the Department’s decision to not use SYSTRA’s approach for estimating how changes to the night flights regime could impact on air fares.

Finally, given the limitations of our available evidence base, it should be noted that this approach does not take account of any other potential indirect impacts that changes to the number of flights in the NQP at an airport could have on the public accounts.

Therefore, it should be noted that the estimates of the public accounts impacts presented in the impact assessment are subject to considerable uncertainty, and that there is also considerable uncertainty surrounding the level and direction of the overall public accounts impacts. Nevertheless, given the scale of the changes to the night flights regime under consideration and the evidence at our disposal, the Department considers that the approach taken is a proportionate approach for estimating these impacts in Section 8.

For the purposes of this analysis, the average level of indirect taxation in the economy is assumed to be 19% in line with the Department’s transport analysis guidance⁶⁰; and the Department has estimate the proportion of passengers travelling for leisure and the proportion of leisure passengers that are UK residents by carrier type and airport using data for all passengers using these airports in 2014 from the Civil Aviation Authority (CAA) as follows (Figure 10).

Figure 10 – Proportion of passengers travelling for leisure, and of which are UK residents

Gatwick	Chartered	Scheduled	Low cost carrier
Proportion of passengers travelling for leisure	99%	86%	83%
Proportion of leisure passengers that are UK residents	98%	71%	70%

Stansted	Chartered	Scheduled	Low cost carrier
Proportion of passengers travelling for leisure	99%	65%	85%
Proportion of leisure passengers that are UK residents	99%	57%	58%

8 Costs and Benefits of Final Policy Option

8.1 Do Minimum scenario

This section provides a brief overview of the analysis for the Do Minimum scenario. Further results for this scenario are presented in Appendix C.

A particular limitation of our analysis at consultation stage was our estimates 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 Minimum scenario. The reasons for this were:

- The fleet mix modelling of freighters at Stansted suggested that there would be a significant decline in the number of QC/0 movements by freighters. This result appeared 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 arose purely as a result of the lifetime of freighters that has been assumed, which was subject to considerable uncertainty.

⁶⁰ <https://www.gov.uk/guidance/transport-analysis-guidance-webtag>

- Our analysis, which was based on data for 2014/15, significantly under-estimated the actual growth in movements by QC/0 aircraft at Stansted between 2014/15 and 2015/16.
- Due to the limitations of our fleet mix modelling, our analysis also likely underestimated the take up of next generation QC/0 aircraft at all airports.
- For new aircraft types, the QC categorisation we assumed were intended to represent the highest QC ratings that could be assigned to these aircraft (see Section 7 for more details), which was likely to further under-estimate the number of movements by next generation QC/0 aircraft.
- Finally, the simplifying assumptions in our analysis led to the growth in QC/0 movements being under-estimated under our Do Minimum 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 limits⁶¹.

Holding all other assumptions constant, this meant that our analysis at consultation stage was 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. But, in other circumstances, these limitations meant the analysis over-estimated 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 Minimum scenario). Given the no growth assumption at Heathrow, it was expected that the analysis for Heathrow would be unaffected.

The above points were a key cause of the uncertainty surrounding the costs and benefits that were estimated at consultation stage. In response to this, for the final Impact Assessment we have:

- Sought additional evidence and information through the consultation on the appropriate assumption regarding fleet mix changes, including the retirement age of freighters. As a result of some useful discussion on future fleet plans and evidence on current freighter ages⁶², we extended the freighter lifetime assumption used in this analysis from 30 to 35 years. The rationale for this includes the lower utilisation of express freighters following conversion from passenger aircraft at a typical age of 15-25 years, meaning the lifetime of these aircraft can be extended to 40 years plus as they have more infrequent flight cycles. Based on discussions with industry, this update reflects a conservative estimate for freighter retirement age.
- We have updated the base data on actual movements at all three airports from 2014/15 data to 2015/16, the latest full regime year available. This has provided a more realistic picture of the current fleet mix, including the relative proportion of aircraft in different QC categories.

⁶¹ 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 Minimum scenario.

⁶² CAA data on actual flight movements at all three airports.

- Further information on the next generation of fleet and in particular the take up of QC/0 aircraft was requested as part of the consultation. We have reviewed evidence submitted by consultees and revised assumptions on the future fleet mix to reflect this evidence. The proportion of next generation aircraft at, for example, Stansted grows by around 35% between 2017 and 2022⁶³.

By making these changes, the analysis in this Impact Assessment is likely to underestimate the growth in QC/0 aircraft to a lesser extent than at consultation stage, and now better reflects the current market and future plans of the industry regarding fleet mix. The following limitations of the analysis remain;

- For new aircraft types, the QC categorisation we assumed were intended to represent the highest QC ratings that could be assigned to these aircraft (see Section 7 for more details), which was likely to further under-estimate the number of movements by next generation QC/0 aircraft.
- Finally, the simplifying assumptions in our analysis led to the growth in QC/0 movements being under-estimated under our Do Minimum 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.

8.1.1 Gatwick: Do Minimum 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 2019/20 to 2021/22. 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 in all 5 years and over-run its movement limit in the summer season by 5% and 8% in the first 2 years, followed by 10% between 2019/2020 to 2021/22.

8.1.2 Heathrow: Do Minimum Scenario

It is estimated that the number of night flights in the night quota period at Heathrow during the 5 years of the next night flights regime (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 Minimum 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 until the end of the regime. The number of flights in the night quota period would be constrained by the limits in the 2020/21 and 2021/22 winter seasons. It is estimated that Stansted would carry-over 10% of its movement limit 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 9% in 2017/18 and 10% in each subsequent year and over-run its quota limit in the summer season in some years by between around 4% and 5%.

⁶³ DfT analysis of fleet mix forecasts 2017

8.1.4 Estimated number of people affected by night noise

As explained earlier, the 48dB $L_{Aeq, 6.5hr}$ is the lowest level night noise contour at which it is possible to produce robust noise contours.⁶⁴ Given that this is broadly similar to the lowest level at which the Department for Transport's Transport Appraisal Guidance identifies health costs for noise from night flights, 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 Minimum scenario can be found in Figure 11 below. The reason for the population reducing in this contour at Heathrow, whilst not at Gatwick and Stansted, is due to natural predicted improvements in the QC performance of aircraft over the course of the regime coupled with the assumption of zero growth in night flights. A summary of the populations within the dBA $L_{Aeq, 6.5}$ hour night contours up to 63dBA under the Do Nothing and the Final Policy Option can be found in Appendix F.

Figure 11– Number of people affected at Heathrow, Gatwick and Stansted⁶⁵

Summary of populations within 48 dBA $L_{Aeq, 6.5}$ hour night

	Year	Heathrow*	Gatwick	Stansted
Policy Scenario: Do Minimum	2017-18	89,600	4,600	4,250
	2021-22	80,300	4,600	4,350

* 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 Final Policy Option

As mentioned in Section 5, our preferred policy option is Option 4. This combines the changes considered under the other options. Analysis of all options suggests there would be no difference in impact between options 2, 3 and 4. However for the reasons set out in this impact assessment, option 4 meets the environmental objective whilst also providing additional certainty to communities around all airports and locks in the benefits already delivered at Heathrow and Gatwick. Further detail on the impact of options 2, 3 and 4 on the number of night flights and QC usage at all three airports can be found in Appendix C.

8.2.1 Gatwick: Final Policy Option

Impact on the number of night flights

It is estimated that there would be around 465 fewer night flights (-5%) in the night quota period in total at Gatwick under our Final Policy Option compared to the Do Minimum 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. Under the Final Policy Option, we estimate that Gatwick's growth is constrained in the 2019/20 to 2021/22 seasons. This is unchanged from the Do Minimum.

Benefits

⁶⁴ K. Jones, Environmental Research and consultancy Department, CAA. Aircraft Noise and Sleep Disturbance: A Review (2009) <https://publicapps.caa.co.uk/docs/33/ERC0905.pdf>

⁶⁵ CAA Data

Compared to the Do Minimum scenario, the key benefit of the Final Policy Option is the reduced night noise that would be experienced by local residents that live near Gatwick airport 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. This could be an underestimate since the methodology used (48dB L_{Aeq, 6.5hr}) does not monetise the impacts on all affected populations.

At Gatwick, compared to the Do Minimum scenario, it is estimated that:

- In 2017/18, there is no change in the number of flights in the night quota period and no change in the number of people affected in the 48dB L_{Aeq, 6.5hr} night contour (around 4,600) and no reduction in the size of the contour area (around 37.6 sq km)
- In 2021/22, 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 L_{Aeq, 6.5hr} night contour (around 4,600) and a reduction in the size of the contour area by around 0.5 sq km (around 37.9 sq km compared with around 38.5 sq km).

Estimates of the value of the reduction in sleep disturbance from flights in the NQP at Gatwick under the Final Policy Option compared to the Do Minimum scenario are presented in Figure 12 below. The total value of the reduction in sleep disturbance from night flights in the NQP at Gatwick over the 5 year regime is estimated at around £11,690 (in present value terms and constant prices⁶⁶)^{67 68}.

The illustrative estimates of the scale of the reduction in the costs of other night noise impacts from flights in the NQP at Gatwick is presented in Figure 13; the potential scale of these impacts over the 5 year period is estimated at around £1,700 in total (in present value terms and constant prices⁶⁹). It should be noted that these figures cannot be used to represent the value the government places on the impacts of these health conditions to individuals or society. This impact assessment solely covers the potential scale of these impacts as a result of the changes in noise impacts of our final policy option (compared with the current regime).

Figure 12 - Value of the reduction in sleep disturbance from night flights at Gatwick (Final Policy Option Vs Do Minimum) (Constant prices and not discounted)⁷⁰

	2017/18	2018/19	2019/20	2020/21	2021/22
Sleep disturbance	£0	£0	£4,440	£3,290	£5,250

⁶⁶ The Present Value Base Year is 2017 and the Price Base Year is 2015.

⁶⁷ Figures may not sum due to rounding

⁶⁸ 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.

⁶⁹ The Present Value Base Year is 2017 and the Price Base Year is 2015.

⁷⁰ The Price Base Year is 2015.

Figure 13 - Estimate of the total value of the reduction in other noise impacts from night flights at Gatwick over the 5 year period (Final Policy Option Vs Do Minimum) (Constant prices and not discounted)⁷¹

	Total reduction
Monetised non-sleep disturbance health impacts	£1,900

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

The reduction in the number of flights that are allowed to take place in the NQP at Gatwick under the Final Policy Option compared to the Do Minimum scenario could give rise to indirect benefits to businesses by giving airlines the possibility to charge higher air fares. These indirect benefits have not been estimated for the reasons explained in Section 7 of this impact assessment.

There is no change in the number of flights forecast under the Final Policy Option (Option 4) compared to Option 2. This is because it is estimated that there would be a significant amount of unused noise quota at Gatwick under the Do Minimum scenario, and so the proposed reductions in the noise quota (in Option 4) are estimated to have no further impact on the number of movements compared to the Do Minimum scenario than Option 2 (in which QC/0 aircraft count to the movement limit at all three airports and Stansted’s movement limit is increased to accommodate the number of currently exempt aircraft). This is also because it is estimated that Gatwick can accommodate the noise quota from the new QC/0.125 aircraft in their limits. However, the changes in the Final Policy Option (Option 4) compared with Option 2 should increase the transparency of the regime and provide more certainty to populations living around the airport that the average flight should not get any louder than it currently is. Plus, the changes could have impacts on industry behaviour that lead to long term benefits for communities outside of our appraisal period of 5 years.

Costs

The direct costs to business as a result of the reduction in the number of flights in the NQP at Gatwick under the Final Policy Option (Option 4) compared to the Do Minimum scenario would be felt by Gatwick airport and the airlines operating flights in the NQP; as context, it is estimated that there were around 101 airlines operating flights in the NQP at Gatwick in 2015/16 that could be affected by our proposals. Using the methodology described in Section 7.5.2, the total direct costs to business from the reduction in the number of flights in the NQP at Gatwick under the Final Policy Option (Option 4) compared to the Do Minimum scenario over the 5 year regime are estimated to be around £5.6 million (in present value terms and constant prices⁷²). Figure 14 below shows the estimated direct costs to business in each year of the regime.

⁷¹ The Present Value Base Year is 2017 and the Price Base Year is 2015.

⁷² The Present Value Base Year is 2017 and the Price Base Year is 2015.

Figure 14 - Estimated direct costs to business from the reduction in flights in the NQP at Gatwick (Final Policy Option Vs Do Minimum) (Constant prices)⁷³

	2017/18	2018/19	2019/20	2020/21	2021/22
Direct Costs to Airlines	£0	£0	£2.15m	£1.54m	£2.45m
Direct Costs to Gatwick Airport	£0	£0	£0.03m	£0.03m	£0.04m
Total Direct Costs to Business	£0	£0	£2.18m	£1.57m	£2.49m

It is separately estimated that the Government would also experience a reduction in tax revenues as a result of the reduction in the number of flights in the NQP at Gatwick under the Final Policy Option (Option 4) compared to the Do Minimum scenario. Using the approach explained in Section 7.5.3, the total reduction in tax revenues as a result of the reduction in the number of flights in the NQP at Gatwick under the Final Policy Option (Option 4) compared to the Do Minimum scenario over the 5 year regime is estimated to be around £0.2 million (in present value terms and constant prices⁷⁴). Figure 15 below shows the estimated reduction in tax revenues in each year of the regime.

Figure 15 - Estimated reduction in tax revenues from the reduction in flights in the NQP at Gatwick (Final Policy Option Vs Do Minimum) (Constant prices)⁷⁵

	2017/18	2018/19	2019/20	2020/21	2021/22
Reduction in tax revenues	£0	£0	£0.1m	£0.1m	£0.1m

*Note – For the avoidance of doubt, the estimates of the reduction in tax revenues shown in this figure are not included in the estimates of the “Business Net Present Value” and the “Net cost to business per year”.

Finally, the reduction in the number of flights in the NQP at Gatwick under the Final Policy Option (Option 4) compared to the Do Minimum scenario could also give rise to a number of other indirect costs to businesses, including through the knock on impacts this would have on business passengers, the air freight sector and the wider economy; and leisure passengers. These indirect costs have not been estimated for the reasons explained in sections 6 and 7 of this IA.

8.2.2 Heathrow: Final Policy Option

It is estimated that there would be no change in the number of night flights in the night quota period at Heathrow under our Final Policy Option (Option 4) compared to the Do Minimum 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.

As it is estimated that there would be no change in the number of night flights in the night quota period at Heathrow under our Final Policy Option compared to the Do Minimum scenario, no

⁷³ The Price Base Year is 2015.

⁷⁴ The Present Value Base Year is 2017 and the Price Base Year is 2015.

⁷⁵ The Price Base Year is 2015.

monetised costs or benefits are expected at Heathrow during our appraisal period of 5 years. There is no change in either the number of people within the 48 dB contour in 2017/18 (89,600) or 2021/22 (80,300) compared to the Do Minimum, or in the area of the contour (28.8 sq km in 2017/18 and 24.7 sq km in 2021/22). However, there could be benefits in the form of greater certainty to populations around Heathrow that the average flight cannot get any louder than it currently is. Plus, the number of flights and composition of the fleet could change in the longer term due to the incentives we are providing to encourage quieter aircraft in the night period. More generally, introducing a new QC category and counting all movements towards the limit has the benefits of increasing the transparency of the regime at Heathrow, as is the case at all airports.

8.2.3 Stansted: Final Policy Option

Impact on the number of night flights

It is estimated that there would be around 2,475 fewer night flights (-11%) in the night quota period at Stansted in total under the Final Policy Option (Option 4) compared to the Do Minimum 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 greater number of movements by QC/O aircraft at Stansted. Growth is estimated to be constrained in 2018/19 to 21/22 in winter and in all years of the regime in the summer seasons. This is a change compared to the Do Minimum, since growth is now estimated to be constrained in winter 2018/19 and 2019/20 and in summer 2017/18.

Benefits

The key benefit of the Final Policy Option (Option 4) compared to the Do Minimum is the reduced night noise that would be experienced by populations surrounding Stansted airport as a result of the reduction in the number of movements in the night quota period. This could be an underestimate since the methodology used (48dB LA_{eq, 6.5hr}) does not monetise the impacts on all affected populations.

At Stansted, compared to the Do Minimum 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 LA_{eq, 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 36.4 sq km compared with around 36.7 sq km);
- In 2021/22, the reduction in the number of flights in the night quota period would lead to around 300 fewer people affected in the 48dB LA_{eq, 6.5hr} night contour (around 4,050 compared to around 4,350), and a reduction in the size of the contour area by around 1.6 sq km (around 35.8 sq km compared with around 37.4 sq km).

Estimates of the value of the reduction in sleep disturbance from flights in the NQP at Stansted are presented in Figure 16 below. The total value of the reduction in sleep disturbance from night flights in the NQP at Stansted over the 5 year regime is estimated at around £204,900 (in present value terms and constant prices⁷⁶). The illustrative estimates of the scale of the reduction in the costs of other night noise impacts from flights in the NQP at Stansted is presented in Figure 17; the potential scale of these impacts over the 5 year period is estimated at around £23,300 in total (in present value terms and constant prices⁷⁷). It should be noted that these figures cannot be used to represent

⁷⁶ The Present Value Base Year is 2017 and the Price Base Year is 2015.

⁷⁷ The Present Value Base Year is 2017 and the Price Base Year is 2015.

the value the government places on the impacts of these health conditions to individuals or society. This impact assessment solely covers the potential scale of these impacts as a result of the changes in noise impacts of our final policy option (compared with the current regime).

Figure 16 - Value of the reduction in sleep disturbance from flights in the NQP at Stansted (Final Policy Option Vs Do Minimum) (Constant prices and not discounted)⁷⁸

	2017/18	2018/19	2019/20	2020/21	2021/22
Sleep disturbance	£6,340	£41,980	£52,840	£60,280	£62,320

Figure 17 - Estimate of the total value of the reduction in other noise impacts from flights in the NQP at Stansted over the 5 year period (Final Policy Option Vs Do Minimum) (Constant prices and not discounted)⁷⁹

	Total reduction
Monetised non-sleep disturbance health impacts	£25,400

There are also expected to be a number of other benefits from the reduction in flights in the NQP at Stansted, including a reduction in the other costs of night noise; improved air quality and reduced greenhouse gas emissions. For the reasons outlined in Section 6.1 **Error! Reference source not found.**, these benefits are not monetised in this IA.

As at Gatwick, the reduction in the number of movements under the Final Policy Option (Option 4) is unchanged compared to Option 2. This is because our modelling does not expect the introduction of the new QC/0.125 category to result in a binding QC limit after allowing for overruns and carryovers. However, there could be benefits in the form of greater certainty to populations around Stansted that the average flight cannot get any louder than it currently is. Plus, the number of flights and composition of the fleet could change in the longer term due to the incentives we are providing to encourage quieter aircraft in the night period. More generally, introducing a new QC category and counting all movements towards the limit has the benefits of increasing the transparency of the regime at Stansted, as is the case at all airports.

Finally, the reduction in the number of flights that are allowed to take place in the NQP at Stansted under the Final Policy Option (Option 4) compared to the Do Minimum scenario could give rise to indirect benefits to businesses by giving airlines the possibility to charge higher air fares. These indirect benefits have not been estimated for the reasons explained in Section 7 of this IA.

Costs

The direct costs to business as a result of the reduction in the number of flights in the NQP at Stansted under the Final Policy Option (Option 4) compared to the Do Minimum scenario would be felt by Stansted airport and the airlines operating flights in the NQP at Stansted; as context, it is estimated that there were around 141 airlines operating flights in the NQP at Stansted in 2015/16 that could be affected by our proposals. Using the methodology described in Section 7.5.2, the total direct costs to

⁷⁸ The Price Base Year is 2015.

⁷⁹ The Present Value Base Year is 2017 and the Price Base Year is 2015.

business from the reduction in the number of flights in the NQP at Stansted under the Final Policy Option (Option 4) compared to the Do Minimum scenario over the 5 year regime are estimated to be around £5.3 million (in present value terms and constant prices⁸⁰). Figure 18 below shows the estimated direct costs to business in each year of the regime.

Figure 18 - Estimated direct costs to business from the reduction in flights in the NQP at Stansted (Final Policy Option Vs Do Minimum) (Constant prices)⁸¹

	2017/18	2018/19	2019/20	2020/21	2021/22
Direct Costs to Airlines	£0.36m	£0.97m	£1.10m	£1.19m	£1.20m
Direct Costs to Stansted Airport	£0.06m	£0.18m	£0.21m	£0.23m	£0.24m
Total Direct Costs to Business	£0.42m	£1.15m	£1.32m	£1.43m	£1.44m

It is separately estimated that the Government would also experience a reduction in tax revenues as a result of the reduction in the number of flights in the NQP at Stansted under the Final Policy Option (Option 4) compared to the Do Minimum scenario. Using the approach explained in Section 7.5.3, the total reduction in tax revenues as a result of the reduction in the number of flights in the NQP at Stansted under the Final Policy Option (Option 4) compared to the Do Minimum scenario over the 5 year regime is estimated to be around £1.3 million (in present value terms and constant prices⁸²). Figure 19 below shows the estimated reduction in tax revenues in each year of the regime.

Figure 19 - Estimated reduction in tax revenues from the reduction in flights in the NQP at Stansted (Final Policy Option Vs Do Minimum) (Constant prices)^{*83}

	2017/18	2018/19	2019/20	2020/21	2021/22
Reduction in tax revenues	£0.1m	£0.3m	£0.3m	£0.4m	£0.4m

*Note – For the avoidance of doubt, the estimates of the reduction in tax revenues shown in this figure are not included in the estimates of the “Business Net Present Value” and the “Net cost to business per year”.

Finally, the reduction in the number of flights in the NQP at Stansted under the Final Policy Option (Option 4) compared to the Do Minimum scenario could also give rise to a number of other indirect costs to businesses, including through the knock on impacts this would have on business passengers, the air freight sector and the wider economy; and leisure passengers. These indirect costs have not been estimated for the reasons explained in Sections 6 and 7 of this impact assessment.

8.2.4 Familiarisation costs

It is possible that stakeholders could 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 invited views through

⁸⁰ The Present Value Base Year is 2017 and the Price Base Year is 2015.

⁸¹ The Price Base Year is 2015.

⁸² The Present Value Base Year is 2017 and the Price Base Year is 2015.

⁸³ The Price Base Year is 2015.

the consultation on the time required for stakeholders, largely airports, airlines and communities, to read and understand the updated regulation and received no substantial evidence that there would be familiarisation costs to business of these new restrictions.

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

Although these estimates are subject to considerable uncertainty, DfT's estimates of the change in the number of night flights in the night quota period that are presented in this impact assessment 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 impact assessment have been produced using the ANCON model, which is fully compliant with internationally agreed best practice. 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 impact assessment 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). Other noise impacts on health have been presented in this IA to give an indication of their scale, however, whilst we have provided estimates to illustrate the potential scale of these impacts, we have not included these estimates in the net present value calculation since the Department's Transport Analysis Guidance does not contain an approved methodology for estimating the change in the value of the other impacts of night noise on health (see Section 7.4). Due to inconclusive and limited evidence, we have not quantified other noise impacts on amenity.

Given the scale of the changes to the night flights regime under consideration and the evidence at our disposal, the Department considers that the approaches taken to produce the estimates of the direct economic impacts on airports and airlines, and the estimates of the public accounts impacts, presented in the impact assessment, are proportionate approaches for estimating these economic impacts, and that the former is a proportionate approach for estimating the equivalent annual net direct cost to business (EANDCB). The changes to the night flights regime under consideration could also give rise to other indirect impacts to businesses, passengers and the public accounts; these indirect impacts have not been estimated in this impact assessment for the reasons explained in Sections 6 and 7. In addition, due to the inconclusive and/or limited evidence, we have not quantified or monetised any other wider economic impacts.

We have not conducted any sensitivity analysis for this impact assessment as it was not considered proportionate to do so.

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.

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

Whilst the process for renewing the current night flights regime stems from EU legislation, the night flights restrictions at Gatwick, Heathrow and Stansted are domestic rules that are implemented through domestic, not EU, law. In other words, there is and can be no gold plating.

Since the night flights restrictions at Gatwick, Heathrow and Stansted are domestic rules that regulate business, the Government considers that the night flights regime 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 only directly impact airlines and airports (see Section 7.5.2 for further details)⁸⁴. Therefore, the Department considers that 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)⁸⁵ for airlines and airports.

The expiry of the existing restrictions will score as a benefit to business and this offsets the costs to business associated with the continuation of the existing restrictions under the Do Minimum scenario. Therefore, the Department considers that the Do Minimum scenario is the appropriate counterfactual for estimating the EANDCB of the Final Policy Option compared against.

On the basis of the methodology described in Section 7.5.2 and the results of this analysis presented in Section 8 of this IA, the present value of the total net direct costs to airlines and airports under Final Policy Option compared to the Do Minimum scenario over the 5 year regime is estimated at around £10.9 million (Present Value Base Year 2017, Price Base Year 2015). This comprises the following estimates from Section 8 of this IA:

- the total direct costs to business from the reduction in the number of flights in the NQP at Gatwick under the Final Policy Option (Option 4) compared to the Do Minimum scenario over the 5 year regime are estimated to be around £5.6 million (in present value terms and constant prices); and
- the total direct costs to business from the reduction in the number of flights in the NQP at Stansted under the Final Policy Option (Option 4) compared to the Do Minimum scenario over the 5 year regime are estimated to be around £5.3 million (in present value terms and constant prices).

Therefore, using the Business Impact Target Assessment Calculator, the EANDCB is estimated at around £2.2 million per year (Present Value Base Year 2015, Price Base Year 2014).

It should be noted that some of the costs to business will fall on non-UK airlines. However, there are considerable difficulties in apportioning the costs to airlines between UK and non-UK airlines (e.g. a comprehensive determination of the nation of ownership of airlines is in most cases unavailable). So, any estimates of this would rely heavily on assumptions and be no more than indicative. Therefore, for the purposes of this impact assessment, the Department has adopted a conservative approach, and used the full estimate of the present value of the total net direct costs to airlines and airports when estimating the EANDCB above.

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 sub-sections.

We asked for further evidence on these impacts as part of our consultation. We have reviewed the evidence submitted regarding these wider impacts and have incorporated relevant changes where applicable.

⁸⁴ The Government considers that all other impacts on business are indirect

⁸⁵ 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 Minimum scenario.

11.1 Competition assessment

It is estimated that the final policy option under consideration in this impact assessment 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 Minimum scenario, but would have no impact on the number of night flights in the night quota period at Heathrow. This illustrates the potential for this 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 Minimum scenario and is therefore subject to the significant uncertainty surrounding our analysis.

Having reviewed the consultation responses, we do not have sufficient information to provide a robust methodology to capture the impacts on competition. Instead we have identified the potential impacts on competition which are discussed in more detail below. It is worth noting that despite this limitation of the analysis however, the very small reduction in the number of night flights that would occur under the final policy option would suggest there would also be a very small impact on competition.

- 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 as highlighted in Section 6.2.4. To the extent that their competitors make use of night flights at other airports, this could have impacts on their competitiveness. Lower profits for UK businesses may further result in lower levels of investment in the UK which could potentially harm the international competitiveness of the UK.

11.2 Small and Micro Business Assessment (SaMBA)

Small businesses (up to 49 FTE employees) and micro-businesses (up to 10 employees)⁸⁶ are not currently exempt from the night flights regime. In reaching a final policy decision consideration has therefore been given to how the policy options may impact on small and micro businesses.

The businesses on which the night flight regime has direct impacts are airports and airlines.

Gatwick, Heathrow and Stansted are the primary airports affected by the regime and have more than 50 employees, meaning they do not meet the Small and Micro Business Assessment (SaMBA) criteria.

Whilst 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, we have completed analysis that suggests nearly all commercial airlines operating during the night period would have more than 50 employees. Furthermore given the scale of operations required to run an airline, including pilots

⁸⁶ Better Regulation Framework

and flight crew, maintenance crew, HR etc., it would be reasonable to assume nearly all commercial airlines would require more than 50 employees to operate.

Analysis of CAA data (on night flights during the period 2014/15 at Gatwick, Heathrow and Stansted, combined with CAA data on aircraft registration and ownership) suggests that, even for night flights not operated by commercial airlines e.g. private business jets, small and micro businesses are unlikely to be directly affected. The analysis revealed these types of aircraft were typically owned by large corporations or subsidiaries of large corporations which can be assumed to have more than 50 employees.

It is theoretically possible that there could be small or micro businesses that operate night flights which may be affected by the proposals in this Impact Assessment. However, the CAA have estimated that this would only affect a handful of airline operators, thus it would not be proportionate to analyse the impacts for this Impact Assessment. As mentioned above, we also did not receive any evidence from the consultation which we were able to incorporate in to this impact assessment on what the impact would be on smaller airlines or night flights operators, for example from those involved in business or general aviation.

11.3 Equalities Impact Assessment

The policy options referred to in this impact assessment have been reviewed for relevance, but since the reduction in noise impacts of the policy options **relative to the baseline** are not expected to have any variation in impacts on different groups, an Equalities Impact assessment is not required. All options, including the preferred option, place restrictions on the number and noise levels of night flights but do not fully ban operations. Whilst it can be expected on an aggregate level that, for a given airport, the least profitable routes will be dropped before others, it is not possible to forecast how this will be split between different airlines nor is there any evidence that specific groups of society will be affected more than others.

However, based on consultation responses we have considered the impact night flights could have on different groups of society. For instance, night flights may have a disproportionate impact on those sensitive to noise and those already severely impacted. As explained in Section 6.1.3 (Noise Impacts: Other Impacts), the impact on children has been assessed in the NORAH and RANCH studies. These studies acknowledge that noise exposure from these flights may affect cognitive development, but the reports are unclear whether the effects are attributable to daytime or night time noise. Furthermore, there is no evidence for long-term persistent effects on cognitive development. Dr Charlotte Clark's paper⁸⁷, undertaken for the Airports Commission concludes that there is increasing evidence to support the use of prevention measures such as insulation, preventative policy, guidelines and limit values.

Whilst night flights may disproportionately affect those that are more sensitive to noise, the noise impacts as a result of particular policy options considered in this Impact Assessment are not expected to, given the baseline used for comparison of these options.

⁸⁷ 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

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. Option 4 within this impact assessment is our preferred measure of doing so as it enables us to achieve the environmental objective.

Introducing a new QC category and ensuring all flights are included in the restrictions will give more certainty to communities about the level of noise they can expect to experience and prevent a potentially unlimited number of currently exempt flights from operating during the night period. As a result of these changes to the QC system it is also necessary to adjust Stansted's movement to ensure the existing benefits of night flights at the airport are maintained. Setting noise quota limits as we have decided will also help to lock-in the benefits that have been derived from new quieter aircraft in recent years and reassure communities that existing aircraft should not be replaced by louder ones. These limits will ensure industry have clear direction and incentives to adopt the quietest technology whilst communities have more certainty over the future noise exposure.

These restrictions will be reviewed again to ensure decisions on what should replace them can be taken before they expire in October 2022. As set earlier in this document, we are also reviewing the Government's role in setting these restrictions at these airports, and pending the outcome of our consultation on these matters, there may be opportunities for these restrictions to be replaced by alternatives before they expire and for the Government to no longer set them in this way.

13 Post Implementation Review Plan

1. **Review status:** Please classify with an 'x' and provide any explanations below.

X	Sunset clause		Other review clause		Political commitment		Other reason		No plan to review
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The next night flights runs for 5 years and will expire in October 2022.

2. **Expected review date** (month and year, xx/xx):

1	0	/	2	2
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13.1 Rationale for PIR approach:

Rationale for PIR approach:

We currently estimate the net impacts to be below £50m, however, there are more impacts that the Department is unable to monetise currently, but that are likely to have an impact. However due to limited data and evidence reasons, we expect the evidence sought to be Medium.

This is a high profile and contentious area of policy. When reviewing restrictions before 2022, we will conduct robust analysis wherever it is proportionate to do so. However, given the current availability of evidence, the Department is in no position to quantify all impacts and use bespoke monitoring and evaluation data to address evidence gaps. We welcome new evidence to support further monetisation of the impacts of changes to the regime, and will review and incorporate new robust evidence into analysis where it is relevant.

This data collected (outlined below) is already produced by the airports on a weekly basis and can be produced very quickly, allowing the Department to monitor the policy with little resource. However, any further impact evaluation that may be completed as a result of new evidence may require a higher level of resource to complete.

Process evaluation will be completed, using monitoring data to check whether the number of flights and noise level emitted is being reduced compared to a continuation of the regime, as expected. This will be used to check if the airports are following the regulations as expected. Throughout the course of the current regime, each airport will provide a detailed weekly breakdown of the:

- Number of total runway movements
- Number of movements in each QC category
- Number of movements exempt from restrictions
- Total number of arrivals and departures
- Number of not counted delays, government and emergency flight movements.
- Amount of QC usage and movements carried over from the previous season.

Eight (8) hour Night contours will also be produced annually for each airport.

A light-touch impact evaluation will also be used, making use of the monitoring data available (8hr Night contours) to check whether the reduction in the noise level of flights has had the desired impact of reducing the number of people significantly impacted by noise in the night period, while maintaining the economic benefits of night flights.

It is not possible to evaluate the impact of the restrictions on the level of night noise compared to a deregulated market. The details outlining why we cannot accurately estimate a deregulated market are explained in the IA.

We will consider the change in local circumstances at these airports to check the necessity for central government regulations. For example, Stansted may agree restrictions as a part of local planning conditions as Heathrow has. This could necessitate a more light touch approach to restrictions in the future.

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

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

Noise Classification (EPNdB) ⁸⁸	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)

⁸⁸ 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 C

The tables below provide further details on the estimated total movements in the night quota period and noise quota usage (QC) under the Do Minimum options and policy options. 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 5.

Figure 20 – Gatwick forecasts – Policy Option 1 (Do Minimum)

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	2035	2085	1,065
Winter 2018/19	2085	2135	1,090
Winter 2019/20	1980	2030	1,030
Winter 2020/21	1805	1855	930
Winter 2021/22	1805	1885	920
Summer 2018	12060	12110	5,210
Summer 2019	12470	12520	5,385
Summer 2020	12645	12700	5,460
Summer 2021	12645	12715	5,460
Summer 2022	12645	12755	5,445

Figure 21 – Gatwick forecasts – Policy Options 2-4

Season	Total movements including QC/0.125 and QC/0 aircraft:	Policy Option 2 & 3	Policy Option 4
	Movement limits (no carryovers/overruns): Winter = 3250 Summer = 11200	Total QC QC limits (no carryovers/overruns): Winter 2017/18 = 2000 Summer 2018 = 6200	Total QC QC limits (no carryovers/overruns): Winter 2017/18 = 2000 (followed by a reduction to 1785 in 2018/19) Summer 2018 = 6200 (followed by a reduction to 5150 in 2019)
Winter 2017/18	2085	1065	1065
Winter 2018/19	2135	1090	1090
Winter 2019/20	1930	975	975
Winter 2020/21	1805	905	905
Winter 2021/22	1805	880	880
Summer 2018	12110	5210	5210
Summer 2019	12520	5385	5385
Summer 2020	12645	5435	5435
Summer 2021	12645	5430	5430
Summer 2022	12645	5395	5395

Figure 22 - Heathrow Forecasts – Policy Option 1 (Do Minimum)

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	2,675	2,690	2,010
Winter 2018/19	2,670	2,690	1,720
Winter 2019/20	2,635	2,690	1,480
Winter 2020/21	2,615	2,690	1,450
Winter 2021/22	2,605	2,690	1,435
Summer 2018	2,950	2,980	2,075
Summer 2019	2,945	2,980	1,945
Summer 2020	2,905	2,980	1,800
Summer 2021	2,885	2,980	1,755
Summer 2022	2,870	2,980	1,730

Figure 23 - Heathrow forecasts – Policy Options 2- 4

Season	Total movements including QC/0.125 and QC/0 aircraft:	Policy Option 2 & 3	Policy Option 4
	Movement limits (no carryovers/overruns): Winter = 2550 Summer = 3250	Total QC QC limits (no carryovers/overruns): Winter 2017/18 = 4080 Summer 2018 = 5100	Total QC QC limits (no carryovers/overruns): Winter 2017/18 = 4080 (followed by a reduction to 2415 in 2018/19) Summer 2018 = 5100 (followed by a reduction to 2735 in 2019)
Winter 2017/18	2,690	2,010	2,010
Winter 2018/19	2,690	1,680	1,680
Winter 2019/20	2,690	1,430	1,430
Winter 2020/21	2,690	1,400	1,400
Winter 2021/22	2,690	1,385	1,385
Summer 2018	2,980	2,075	2,075
Summer 2019	2,980	1,935	1,935
Summer 2020	2,980	1,785	1,785
Summer 2021	2,980	1,740	1,740
Summer 2022	2,980	1,715	1,715

Figure 24 - Stansted Forecasts – Policy Option 1 (Do Minimum)

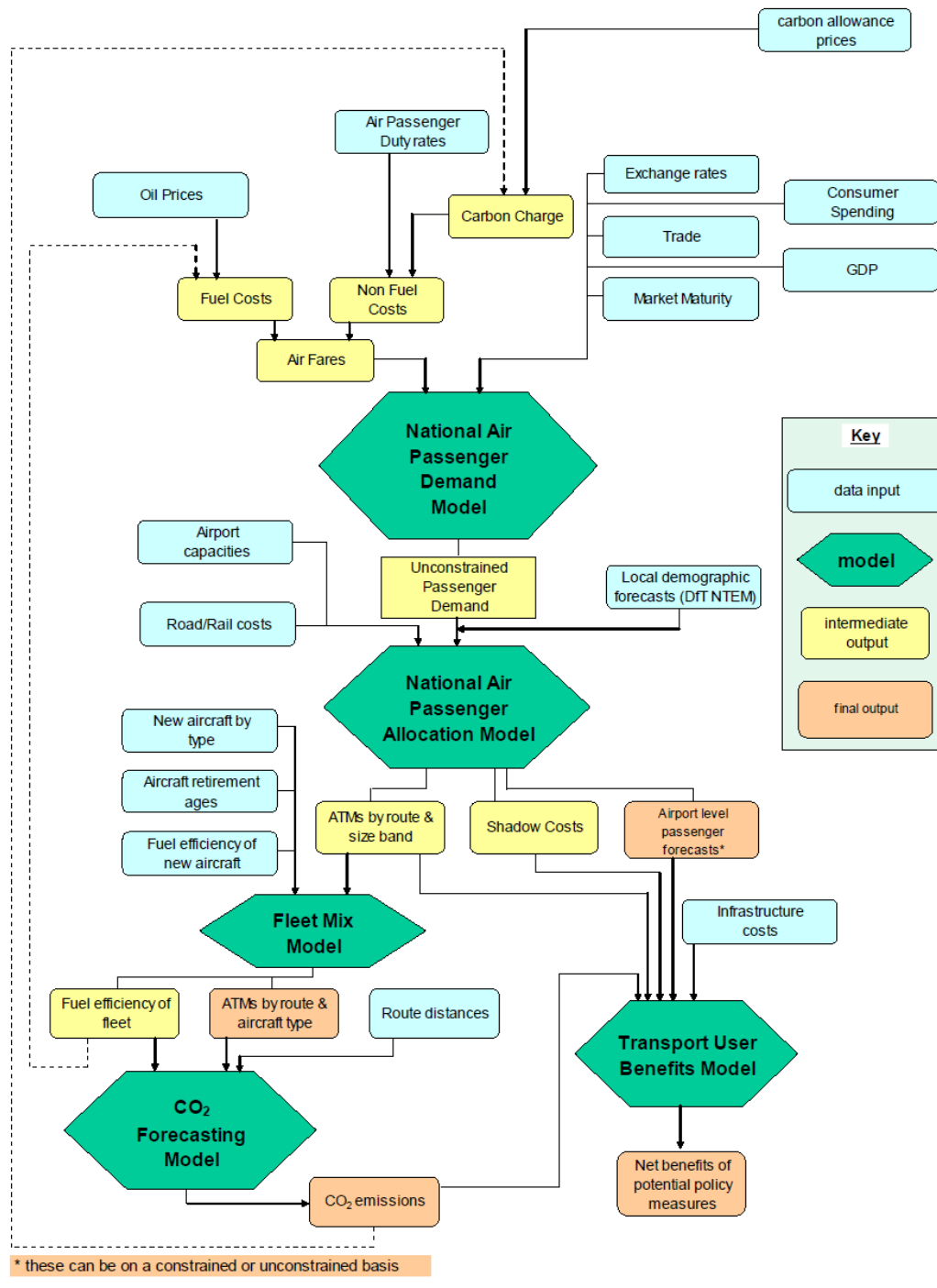
Season	Total movements excluding current exempt QC/0 aircraft Movement limits (no carryovers/overruns): Winter = 5000 Summer = 7000	Total movements including current QC/0 aircraft	Total QC QC limits (no carryovers/overruns): Winter = 3310 Summer = 4650
Winter 2017/18	3,575	4,410	2,605
Winter 2018/19	3,650	4,505	2,660
Winter 2019/20	3,730	4,605	2,720
Winter 2020/21	3,780	4,665	2,755
Winter 2021/22	3,790	4,675	2,760
Summer 2018	8,135	9,595	5,165
Summer 2019	8,200	9,670	5,205
Summer 2020	8,200	9,675	5,205
Summer 2021	8,200	9,675	5,200
Summer 2022	8,200	9,675	5,200

Figure 25 - Stansted forecasts – Policy Options 2- 4

Season	Total movements including QC/0.125 and QC/0 aircraft: Movement limits (no carryovers/overruns): Winter = 5600 Summer = 8100	Policy Option 2 – 4 Total QC QC limits (no carryovers/overruns): Winter 2017/18 = 3310 Summer 2018 = 4,650
Winter 2017/18	4,410	2,605
Winter 2018/19	4,230	2,505
Winter 2019/20	4,230	2,505
Winter 2020/21	4,230	2,505
Winter 2021/22	4,230	2,505
Summer 2018	9,470	5,095
Summer 2019	9,470	5,120
Summer 2020	9,470	5,120
Summer 2021	9,470	5,115
Summer 2022	9,470	5,115

Appendix D

UK aviation forecasting framework⁸⁹



⁸⁹ Department for Transport. UK Aviation Forecasts. January 2013. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/223839/aviation-forecasts.pdf

Appendix E

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 areas⁹⁰

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%

⁹⁰ CAA Data, 2016

Appendix F

A summary of the LAeq, 6.5 hour night contours at Heathrow and Gatwick from 48dBA to 63dBA in the Do Nothing scenario and the Final Policy Option.

LHR Do Nothing 2017/18

Contour (dBA)	Area (sq km)	Population (1000s)	Households (1000s)
48	28.8	89.6	33.9
51	14.2	44.4	16.7
54	7.1	14.6	5.4
57	3.6	2.4	0.9
60	2.0	0.6	0.2
63	1.3	<0.1	<0.1

LHR Do Nothing 2021/22

Contour (dBA)	Area (sq km)	Population (1000s)	Households (1000s)
48	24.7	80.3	30.2
51	11.8	37.6	14.2
54	5.7	10.2	3.7
57	2.9	2.2	0.8
60	1.7	<0.1	<0.1
63	1.2	0.0	0.0

LGW Do Nothing 2017/18

Contour (dBA)	Area (sq km)	Population (1000s)	Households (1000s)
48	37.6	4.6	1.7
51	19.0	1.3	0.5
54	9.5	0.5	0.1
57	4.8	0.3	0.1
60	2.4	0.1	<0.1
63	1.3	0.0	0.0

LGW Final Policy Option 2017/18

Contour (dBA)	Area (sq km)	Population (1000s)	Households (1000s)
48	37.6	4.6	1.7
51	19.0	1.3	0.5
54	9.5	0.5	0.1
57	4.8	0.3	0.1
60	2.4	0.1	<0.1
63	1.3	0.0	0.0

LGW Do Nothing 2021/22

Contour (dBA)	Area (sq km)	Population (1000s)	Households (1000s)
48	38.5	4.6	1.7
51	19.4	1.3	0.5
54	9.7	0.5	0.1
57	4.9	0.3	0.1
60	2.4	0.1	<0.1
63	1.3	0.0	0.0

LGW Final Policy Option**2021/22**

Contour (dBA)	Area (sq km)	Population (1000s)	Households (1000s)
48	37.9	4.6	1.7
51	19.1	1.3	0.5
54	9.5	0.5	0.1
57	4.8	0.3	0.1
60	2.4	0.1	<0.1
63	1.3	0.0	0.0