

6	302	LUXEMBURG	930
AZ	419	TURIN	935
LH	1122	NEAPEL	935
LH	1906	MADRID	935
LH	1022	STUTTGART HBF	935
AF	1701	LYON	940
AY	822	HELSINKI	940
AA	071	STANFORD-DALLAS	945
AF	743	PARIS	945
LH	1118	VENEZIA	945
DL	023	DALLAS	950
KL	892	AMSTERDAM	950

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Balanced Approach study Schiphol Airport

Second addendum

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Second addendum

Report

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Summary

The Dutch Ministry of Infrastructure and Water Management (IenW) has commissioned To70 to update the Balanced Approach study report (our reference 22.171.20¹ and 23.171.27²). In this second addendum, an updated combination of measure(s) is presented that contributes to meeting the noise abatement objective in november 2025. This summary provides an overview of the main results.

The most cost-effective measures to meet the noise abatement objectives in November 2025 are:

Pillar	Combination of measures
Reduce noise at source	Use of quieter aircraft during nighttime period
	Additional fleet renewal
	Stimulate use of quieter aircraft through airport charges
Noise abatement operational procedures	Minimize the use of the secondary runways between 13:00 – 15:00
Operating restrictions	Ban aircraft with cumulative margin lower than 13 EPNdB during nighttime
	Cap the number of movements during the nighttime to 27,000 movements
	Cap the number of annual movements to meet the noise abatement objectives

The reduction in terms of noise exposure of the proposed combination has been calculated, resulting in the following reduction compared to the updated baseline scenario (november 2025):

Measure	Number of highly annoyed people within 48 dB(A) L_{den}	Number of houses within 58 dB(A) L_{den}	Number of severely sleep disturbed people within 40 dB(A) L_{night}	Number of houses within 48 dB(A) L_{night}
Noise abatement objective (phase 2 – november 2025)	-15 to 17%	-15 to 17%	-15%	-15%
Impact of combination of measures without cap on the annual movements	-10.5%	-10.5%	-21.0%	-20.5%
Reduction required to meet noise abatement objectives	4.5% to 6.5%	4.5% to 6.5%	Objective is met	Objective is met

The results of this combination of measures leads to the following observations:

- It can be concluded that the L_{night} noise abatement objectives of -15% are met;
- It can be concluded that the L_{den} noise abatement objectives are not yet met with the combination of measures without a cap on the annual number of movements per year;
- In order to meet the L_{den} noise abatement objectives of -15% a cap on the number of movements per year to a minimum of 470.000 movements is required.

¹ https://www.internetconsultatie.nl/balanced_approach_schiphol/document/11061

² <https://www.luchtvvaartindetoekomst.nl/documenten/besluiten/2023/09/01/annex-ii--balanced-approach-study-schiphol-airport-to70>

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1 Introduction

1.1 Introduction

The Dutch Ministry of Infrastructure and Water Management (IenW) has commissioned To70 to update the Balanced Approach study report (our reference 22.171.20 and 23.171.27). This update includes the update of the baseline scenario to match the noise abatement objectives for november 2025 and update of the combination of measures.

1.2 Research question

IenW has commissioned To70 to update the Balanced Approach study report and addendum. The following has been asked to perform:

- Reassessment of existing measures on the shortlist based on the updated noise abatement objectives (to November 2025) and assessment of a selection of measures gathered during the notification phase with the European Commission and the stakeholders;
- Establishing a new shortlist of measures including the reassessment of the existing measures and assessment of new measures;
- Calculation of the most cost effective (combination of) measure(s) to meet the noise abatement objectives.

1.3 Scope and assumptions

- IenW has provided To70 with a selection of measures, which has been gathered during the notification phase;
- IenW commissioned To70 to establish a new combination of measures that would result in a reduction of 15 to 17% (relative to the baseline scenario) for the L_{den} noise abatement objectives in November 2025 instead of the 20% in the initial study and the 15% in the addendum for November 2024;
- The baseline scenario which was developed to represent the situation of November 2024 will also be used as baseline scenario for November 2025;
- This update has been performed in line with the same methodology and tools as used in the Balanced Approach study report (our reference 22.171.20);
- This research is performed in close parallel with research performed by Decisio and Beelining about the cost-effectiveness of the (combination of) measures to meet the noise abatement objectives.

1.4 Reading guide

It is advisable to read this second addendum alongside the Balanced Approach study report (our reference 22.171.20) and the addendum (our reference 23.171.27). Chapter 2 provides an overview updates and reassessments of the measures. Chapter 3 closes of this second addendum with the calculation of the combination of measure(s) to meet the noise abatement objectives.

2 Updates and reassessments

2.1 Noise abatement objectives

lenW has decided to shift the noise abatement objectives to november 2025 (from november 2024). The L_{den} noise abatement objectives as part of this consultation are between -15% to -17% compared to the -15% for the L_{den} noise abatement objectives as presented in the first addendum. Based on this decision, To70 was tasked by lenW to establish a combination of measures that would result in a reduction between 15 to 17% for the number of highly annoyed people within the 48 dB(A) L_{den} and the number of houses within the 58 dB(A) L_{den} compared to the baseline scenario. Table 1 provides an overview of the noise abatement objectives.

Table 1 - noise abatement objectives

Criteria related to the noise abatement objective	Baseline scenario	Noise abatement objectives November 2025
Number of houses within the 58 dB(A) L_{den} contour	7,081	-15% to -17%
Number of highly annoyed people within the 48 dB(A) L_{den} contour	113,862	-15% to -17%
Number of houses within the 48 dB(A) L_{night} contour	5,685	-15%
Number of severely sleep disturbed people within the 40 dB(A) L_{night} contour	24,365	-15%

2.2 Assessment of new measures

lenW has commissioned To70 to reassess measures that were presented in the notification document to see if the measures would still meet the selection criteria if the timeline would shift to november 2025. lenW also commissioned To70 to assess whether new and updated measures would still meet the selection criteria:

- Use of quieter aircraft during nighttime period;
- Additional fleet renewal;
- Stimulate use of quieter aircraft through airport charges;
- Minimize the use of the secondary runways between 13:00 – 15:00;
- Ban aircraft with cumulative margin lower than 13 EPNdB during nighttime;
- Cap the number of movements during the nighttime to 27,000 movements;
- Cap the number of annual movements to meet the noise abatement objectives.

2.2.1 Use of quieter aircraft during nighttime period

A measure was proposed to shift some of the noisier wide body aircraft from the nighttime period to the daytime period and use quieter aircraft during the nighttime period. This measure is based on input from KLM (which substitutions they can do before November 2024) and contains two elements:

- Shift wide-body aircraft movements during nighttime to the daytime period and fill that slot with a narrow-body aircraft during nighttime;
- Replacing a noisier wide-body aircraft with a less-noisy wide-body aircraft, e.g. replacing a Boeing 777-200 for a Boeing 787-10. This noisier aircraft will be replaced from a daytime movement.

This measure has a two-fold effect: the L_{den} penalty for the nighttime movements (10x penalty) is now applied to a (quieter) aircraft instead of a (noisier) wide-body aircraft. This measure meets the selection criteria and has therefore been added to the shortlist of measures and the impact has been calculated as part of the new combinations of measures. Roughly 10,000 movements will be changed as a result of this measure.

2.2.2 Additional fleet renewal

The expected fleet renewal until November 2025 has been reassessed as part of the autonomous development in the baseline scenario. Unlike the conclusion in the addendum to our initial study, there is an indication that the fleet renewal until November 2025 is exceeding the rate of the historic trends at Schiphol Airport. Main driver for this is the fleet renewal process of KLM and Transavia. The number of new aircraft and expected delivery dates were used to establish that roughly 40% of the aircraft that will be introduced until November 2025 is exceeding the rate of the historic trends. lenW has asked To70 to use a 20% margin to take into account any delayed introduction of new aircraft. Therefore, additional fleet renewal (with a 20% margin) has been added to longlist of measures.

This measure meets the selection criteria and has therefore been added to the shortlist of measures and the impact has been calculated as part of the new combinations of measures.

2.2.3 Stimulate use of quieter aircraft through airport charges

A differentiation in airport charges based on noise performance is already in place at Schiphol Airport. Schiphol distinguishes aircraft in 7 categories, ranging from S1 (noisiest aircraft class) to S7 (least noisy aircraft class). This measure is aimed at reducing the noise impact by encouraging airlines to replace noisy aircraft types with quieter aircraft types. This measure aims to do this through stronger differentiation of airport charges. Based on the input received during the consultation phase, it was assumed that roughly 850 movements fall within the S1 class (part of the reaction of the Royal Schiphol Group to the public consultation of the notification document).

This measure has made the shortlist given that the airport charges will be reestablished in April 2025. This was previously the reason why the measure failed to meet the combination of measures in the addendum of the initial study. To determine the impact of this measure, roughly 850 movements with the lowest cumulative margin (including aircraft types like the Airbus A306 and the Boeing 737-300) were replaced in the scenario by representative newer generation aircraft type (including the aircraft types like the Boeing 767-300 and Boeing 737-800).

This measure meets the selection criteria and has therefore been added to the shortlist of measures and the impact has been calculated as part of the new combinations of measures.

2.2.4 Minimize the use of the secondary runways between 13:00 – 15:00

In the initial study, a measure was presented where secondary runway use can be decreased between 07:00 – 08:00 and 13:00 – 15:00. During the notification phase it was concluded by lenW and its stakeholders that implementing this measure on the 07:00 – 08:00 timeframe will lead too many operational consequences. Given this conclusion, the existing measure has been updated to a measure

with forced use of primary runways only between 13:00 – 15:00. The increased use of primary runways and no (allowed) use of the secondary runway will result in delays and other operational inefficiencies.

This measure meets the selection criteria and has therefore been added to the shortlist of measures and the impact has been calculated as part of the new combinations of measures.

2.2.5 Ban aircraft with cumulative margin lower than 13 EPNdB during nighttime

Banning aircraft with a poor noise performance is already made possible through EU regulation 598/2014. Currently, Chapter 3 aircrafts with a cumulative margin of less than 10 EPNdB can be banned based on this regulation. The Royal Schiphol Group proposed a measure to further extend this to ban more aircrafts with a poor noise performance. The existing measure has been updated to take this, and the input from the European Commission, into consideration. The updated measure focuses on aircrafts with a cumulative margin lower than 13 EPNdB during nighttime. This measure is also implemented at other airports and it has become apparent during the notification phase that this measure can become part of this procedure.

Based on the input received during the consultation phase, it was assumed that roughly 2600 movements will be impacted by this measure. 2600 movements with the lowest cumulative margin (including aircraft types like the Airbus A306, Airbus A321 and the Boeing 737-300) were replaced in the scenario by representative (newer) aircraft types (including the aircraft types like the (Airbus A330-200, Boeing 737-800 and latest generation aircraft like the Boeing 737-8 MAX and the Embraer E195-E2).

This measure meets the selection criteria and has therefore been added to the shortlist of measures and the impact has been calculated as part of the new combinations of measures.

2.2.6 Cap the number of movements during the nighttime to 27,000 movements

A cap on the number of movements during the nighttime to 28,700 movements was presented in the addendum of the initial study. After consultation with the European Commission, IenW has commissioned To70 to only include a measure that reduces the number of movements during the nighttime to 27,000 in the combination of measures.

This measure meets the selection criteria and has therefore been added to the shortlist of measures and the impact has been calculated as part of the new combinations of measures.

2.2.7 Cap the number of annual movements to meet the noise abatement objectives

A cap on the number of annual movements will be used as a 'last resort' measure to meet the noise abatement objectives. What the cap on the number of movements needs to be to meet this reduction is not part of this addendum.

3 Combination of measures and results

3.1 Combination of measures from the shortlist

A combination of measures was made based on the philosophy of the Balanced Approach, starting with measures from the 'Reduce noise at source' pillar and moving down to the last pillar 'operating restrictions'. To meet the noise abatement objectives, a combination of measures was made as described in Table 2.

Table 2 - Proposed combination of measures

Pillar	Combination of measures
Reduce noise at source	Use of quieter aircraft during nighttime period
	Additional fleet renewal
	Stimulate use of quieter aircraft through airport charges
Noise abatement operational procedures	Minimize the use of the secondary runways between 13:00 – 15:00
Operating restrictions	Ban aircraft with cumulative margin lower than 13 EPNdB during nighttime
	Cap the number of movements during the nighttime to 27,000 movements
	Cap the number of annual movements to meet the noise abatement objectives

The following steps were followed to calculate the impact of the combination:

1. As a first step, the four measures from pillar 'Reduce noise at source' and 'Noise abatement operational procedures' were implemented on the baseline scenario;
2. After step 1 was completed, it was concluded that all noise abatement objectives were not met and that measures from the 'Operating restrictions' pillar are required to meet the noise abatement objectives;
3. The first operating restriction that was added was the measure 'Ban aircraft with a cumulative margin lower than 13 EPNdB during nighttime', which didn't result in the required reduction to meet the noise abatement objectives;
4. Finally, the cap the number of movements during the nighttime to 27,000 movements was added to the combination of measures.

3.2 Results of (combination of) measures

Table 4 contains an overview of the reduction of the individual measures compared to the baseline scenario. The results of the individual measures using the END criteria are presented in Appendix A .

Table 3 - overview results of combination of measures

Measure	Number of highly annoyed people within 48 dB(A) L_{den}	Number of houses within 58 dB(A) L_{den}	Number of severely sleep disturbed people within 40 dB(A) L_{night}	Number of houses within 48 dB(A) L_{night}
Use of quieter aircraft during nighttime period	-2.2%	-3.5%	-9.2%	-14.4%

Additional fleet renewal	+/- -1% ³	+/- -1%	+/- -0.5%	+/- -0.5%
Stimulate use of quieter aircraft through airport charges	-0.2%	-0.1%	-0.6%	-1.0%
Minimize the use of the secondary runways between 13:00 – 15:00	-1.7%	-1.2%	-0%	-0%
Ban aircraft with cumulative margin lower than 13 EPndB during nighttime	-1.2%	-1.3%	-2.2%	-5.6%
Cap the number of movements during the nighttime to 27,000 movements	-4.6%	-4.9%	-18.6%	-22.2%

Table 4 contains an overview of the reduction of the combination of measures compared to the baseline scenario. The noise abatement objective per criteria is also displayed in the table. The results of the combinations using the END criteria are presented in Appendix A .

Table 4 - overview results of combination of measures

Measure	Number of highly annoyed people within 48 dB(A) L_{den}	Number of houses within 58 dB(A) L_{den}	Number of severely sleep disturbed people within 40 dB(A) L_{night}	Number of houses within 48 dB(A) L_{night}
Noise abatement objective (phase 2 – november 2025)	-15 to 17%	-15 to 17%	-15%	-15%
Impact of combination of measures without cap on the annual number of movements	-10.5%	-10.5%	-21.0%	-20.5%
Reduction required to meet noise abatement objectives	4.5% to 6.5%	4.5% to 6.5%	Objective is met	Objective is met

The results of this combination of measures lead to the following observations:

- It can be concluded that the L_{night} noise abatement objectives of -15% are met by a margin of 6% for the number of houses within the 48 dB(A) L_{night} contour and 6.5% for the number of severely sleep disturbed people within the 40 dB(A) L_{night} contour;
- The effect of the combination of measures on the L_{night} noise abatement objectives is considerably lower then the effect of all individual measures combined. Main reason that has been identified for this is that the nighttime capacity reduction measure reverses the effect of the other measures;
- It can be concluded that the L_{den} noise abatement objectives are not yet met with the combination of measures without a cap on the annual number of movements per year;
- In order to meet the L_{den} noise abatement objectives of -15% a cap on the number of movements per year to a minimum of 470.000 movements is required

³ This measure has been calculated as part of the combination of measures, hence the individual results have not been calculated. An estimation of the impact has been determined using the results of the combination of measures and the underlying information about the measure.

A Appendix A – EU Directive 2002/49/EC (END) criteria

This annex contains the impact of the combination for the following EU Directive 2002/49/EC (END) criteria:

- Number of highly annoyed people within the 55 dB(A) L_{den} contour
- Number of houses within the 55 dB(A) L_{den} contour
- Number of severely sleep disturbed people within the 50 dB(A) L_{night} contour
- Number of houses within the 50 dB(A) L_{night} contour

Measure or combination	Reduction compared to the baseline scenario			
	Number of highly annoyed people within 55 dB(A) L_{den}	Number of houses within 55 dB(A) L_{den}	Number of severely sleep disturbed people within 50 dB(A) L_{night}	Number of houses within 50 dB(A) L_{night}
Baseline scenario	18,193	19,860	1,393	2,648
Combination of measures without cap on the annual number of movements	14,630 (-19.6%)	15,788 (-20.5%)	816 (-41.4%)	1,579 (-40.4%)