UK Civil Aviation Authority

Technical Note: Local Air Quality

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Contents

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1.1 This technical note serves as supporting documentation for the data analysis outlined in the Local Air Quality chapter of the Aviation Environmental Review 2025 (AER). It highlights which data sources were utilised, and why the chosen air pollutants were selected. It explains how the air pollutant values used in the Local Air Quality chapter were generated, and further outlines why the approach used for the local air pollutant calculations was chosen. Furthermore, it provides references for further reading.

1.2 The AER utilises two independent methodologies for the Climate Change and Local Air Quality chapters. Carbon dioxide equivalent emissions (CO_{2e}) values are derived from aircraft fuel flow as modelled over a full flight. In contrast, local air pollutant data (NO_x, SO_x, NMVOC and $PM_{2.5}$) is modelled for aircraft operations below 3,000 feet above airfield. Whilst both independent methodologies are widely used and highly reputable, there may be inconsistencies between the two datasets at lower altitudes of operation. When assessing individual pollutants/emissions, we encourage readers to refer back to the AER's chapters dedicated to Climate Change and Local Air Quality, as applicable.

Local Air Pollutant Inventory

1.3 The local air pollutant inventory data presented in the Annual Environmental Report (AER) is based on the local air pollutant data reported within the National Atmospheric Emissions Inventory (NAEI). The data was prepared by Ricardo on behalf of the Department for Energy Security and Net Zero (DESNZ).

1.4 This technical note provides a brief overview of our approach to local air pollutant inventory modelling. For more information, see the NAEI methodology and Defra's Report: Revision to the Method of Estimating Emissions from Aircraft in the UK Greenhouse Gas Inventory.

1.5 This 2025 AER aligns with the Clean Air Strategy 2019 and reports on the following key air pollutants that relate to aviation: nitrogen oxides (NO_x), sulphur dioxide (SO_2), non-methane volatile organic compounds (NMVOC) and particular matter $PM_{2.5}$. For the purpose of the local air pollutant inventory data, the local air pollutants are reported for the LTO phase only. The inventory does not take into consideration the impact of cruise emissions, such as the impact of NO_x emissions above 3,000ft on ozone (O_3) at ground level, propagation of cruise particulate matter to ground level, and other interdependencies, as summarised in ENVReport2022_Art18.pdf.

1.6 The scope of this year's AER Air Quality chapter is air pollutants produced by aircraft engines only. Ground support vehicle operations, as well as particulates from aircraft brakes and tires, are not included in this year's reporting. According to the IPCC Guidebook, the relationship of the particulate matters $PM_{2.5}$ to PM_{10} for aircraft engine combustion process can be assumed to be equal to 1. This assumption has been made in our analysis, which allowed us to report on as subset of the NAEI data.

1.7 For those airports where the data was available, the following has been taken into consideration to improve the accuracy of the modelling:

- Airport specific taxi times, as opposed to the ICAO standard times.
- Airport specific fleet mix, as opposed to the most representative aircraft and engine types from the default modelling tables.
- Percentage of aircraft with engine reduced thrust rating, as opposed to the assumed 100% take-off thrust.
- Reduced engine taxiing procedure, as opposed to a procedure with all main engines operating.
- As mentioned earlier in this document, the approach to the modelling used for air local air pollutant inventory differs from the modelling of the CO_{2e}. Therefore, the reader must not apply outcomes or findings from the Climate Change analysis chapter to the local air pollutant inventory section and vice versa. It is an aspiration for future iterations of the AER to report on air pollutants and CO_{2e} using a consistent set of assumptions and input data. This, however, is a potential future development.