Introductory Information

Dataset for "Effect of Engine Design Parameters on the Climate Impact of Aircraft: A Case Study Based on Short-Medium Range Mission"

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- This document describes the fuel and emissions of the A320 fleet across 60 city pairs, the temporal response of different climate species, and the ATR_{100} for changes in engine core design parameters, i.e., OPR and TIT, for the RQL and TAPS-II type combustors.
- It acts as the datasheet for the main manuscript published in ***Aerospace***, titled: **Effect of Engine Design Parameters on the Climate Impact of Aircraft: A Case Study Based on Short-Medium Range Mission.** The manuscript is available at: https://doi.org/10.3390/aerospace10121004.
- It is being made public both to act as supplementary data for (further) publications and the PhD thesis of Harjot Singh Saluja and for other researchers to use this data in their work.
- The data in this data set was collected in the Aircraft Noise and Climate Effects section, Department of Control and Operations, Faculty of Aerospace Engineering, Delft University of Technology, between March 2022 and March 2023.
- This research project was made possible by a grant from the Dutch Research Council (grant no: 17367) and Horizon Europe (grant no: 101056863).

Methodological Information

- The engine performance data was generated using the Gas Turbine Simulation Program (GSP), version 11. Data processing and visualization was done in Matlab, version R2022a. Climate simulations were performed in AirClim, version 2.0.
- SI Units were used throughout the research.

*****Datasheet information*****

- The datasheet is a Microsoft Excel workbook, containing nineteen sheets.
- The Document Information sheet describes the title of the research and contact information.
- Fuel and Emissions, RQL sheet describes the fuel consumption and non-CO2 emissions (NOx and nvPM) for changes in core engine design parameters of Operating Pressure Ratio (OPR) column-wise, and Turbine Inlet Temperature (TIT) row-wise, for the RQL combustor. Units for fuel, NOx, and nvPM emissions are in kg(fuel), kg(NO2), and #(nvPM) respectively. The values are given at the fleet level, i.e. across 60 city pairs. Orange-colored cells refer to baseline engine configuration, green colored cells refer to configurations with minimum fuel consumption.
- Emissions, TAPS-II sheet describes the NOx and nvPM emissions in the same format as that of the Fuel and Emissions, RQL sheet.
- The next fourteen sheets describe the species temporal response generated in AirClim starting in the year 2015 and ending in 2150.
    - The sheet name starts with the type of combustor, followed by a comma, followed by the species name for which the response is described. Ex: The RQL, CO2 resp. datasheet describes the temporal CO_2 response of the engines corresponding to the RQL-type combustor. The TAPS-II, Contr. resp. sheet describes the temporal contrail response of the engines corresponding to the TAPS-II combustor.
    - The sheet showing the total response is the summation result of the other six species' responses, CO_2, H_2O, O_3, Contrails, PMO, and CH_4.
    - The years are distributed, row-wise, and the configurations with minimum fuel burn are distributed, column-wise. The *baseline* column refers to the baseline engine and its temporal response.
    - For the sheets beginning with *RQL*, the column header starts with *p* followed by the pressure ratio value, followed by underscore, followed by *t,* and the TIT value corresponding to the minimum fuel burn. Ex: *p35_t1500* refers to the engine which has an OPR of 35 and TIT of 1500K, where minimum fuel consumption is found.
    - For the sheets beginning with TAPS-II, a similar convention follows as given in the previous point, with the term "taps2_" added in front of each column header.
    - The units of the species' temperature response are in milli-kelvins (mK).
- The last two sheets describe the ATR_{100} generated in AirClim measured from the year 2035.
    - The sheet name starts with the type of combustor, followed by a comma, followed by the term "ATR100".
    - The ATR_{100} corresponding to each species is described column-wise. The configurations (SCENARIOS) are described row-wise.
    - For the RQL, ATR100 sheet, the row header starts with *p* followed by the pressure ratio value, followed by an underscore, followed by *t,* and the TIT value corresponding to the minimum fuel burn, followed by the term "_CurTec".
    - For the TAPS-II, ATR100 sheet, the row header starts with the term "taps2_", followed by *p,* followed by the pressure ratio value, followed by an underscore, followed by *t* and the TIT value corresponding to the minimum fuel burn, followed by the term "_CurTec".
    - The units of the response are in mill-kelvins (mK).