

ENabling Optimized DISruptivE airframe-propulsion integration concepts

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List of authors of databases acronyms

VKI	von Karman Institute for Fluid Dynamics
TUD	Technische Universiteit Delft
GPUP	GPU Prime LTD
UR3	Universita Degli Studi Roma Tre
UBRI	University Of Bristol
UTWE	Universiteit Twente
SISW	Siemens Industry Software NV
ECL	Ecole Centrale De Lyon
DLR	Deutsches Zentrum Fuer Luft - Und Raumfahrt EV
ONERA	Office National D'études Et De Recherches Aerospatiales
NLR	Stichting Nationaal Lucht- En Ruimtevaartlaboratorium

1 Introduction

Deliverable 8.1 serves as a key output within the ENODISE project, consolidating and archiving experimental and numerical databases developed through multiple work packages (WPs), including WP3 (Experimental investigations of local optima), WP4 (Modelling of installation effects), WP5 (Optimization of installation effects), and WP6 (Mitigation of adverse installation effects). These databases are essential to make available to the scientific community the aeroacoustic and aerodynamic findings produced through various configurations of propulsion systems, with and without noise mitigation strategies.

The databases presented in this deliverable integrate data from experimental investigations in WP3, which focused on gathering geometries (CAD), boundary conditions that can serve the numerical simulations (inflow characterization, as boundary layer data), aerodynamic performances and acoustic data. The numerical databases of WP4 simulate the corresponding experimental databases of WP3, providing together a robust reference for the different propulsion configurations (A, B, and C), without noise mitigation.

WP5 applied optimization techniques to reduce noise while maintaining high propulsive efficiency, using the modelling techniques developed in WP4. Those optimization techniques produced extra datasets also archived in Deliverable 8.1. In parallel, WP6 contributes by integrating noise mitigation strategies into the experimental and numerical data, offering a comprehensive overview of the impact of mitigation technologies on acoustic and propulsion performances.

A representation of the experimental setup for the different configurations is shown in Fig. 1. The first configuration (A) will allow investigating BLI mechanisms, for the case of a propeller installed above a wing or partly buried within a wing or fuselage. This first category, denoted as 'infinite-chord' where the airframe is featured by the lower wall of the wind tunnel in a wall-bounded jet configuration, is focused on the noise production and propulsive efficiency aspects. This configuration permits studying in detail the effects of laminar-to-turbulent transition and boundary layer development in presence of pressure gradients and wall curvature effects. The second configuration (B) mimics DP systems, where the engines will be mounted on pylons in puller/pusher configurations, and on a control surface. This time, the finite chord of the simplified wing model will permit studying acoustic shielding effects in addition to noise generation and propulsive efficiency. The last configuration (C) is focused on multi-rotor systems. It permits studying the complex potential/viscous interactions between the rotors and stator structure, and to evaluate the possible performance gain and noise control that can be offered by a short duct.

This deliverable documents the curated, cleaned, and archived databases released on the ZENODO platform, ensuring accessibility for future research and validation purposes in both aeronautical and non-aeronautical fields.

2 Databases

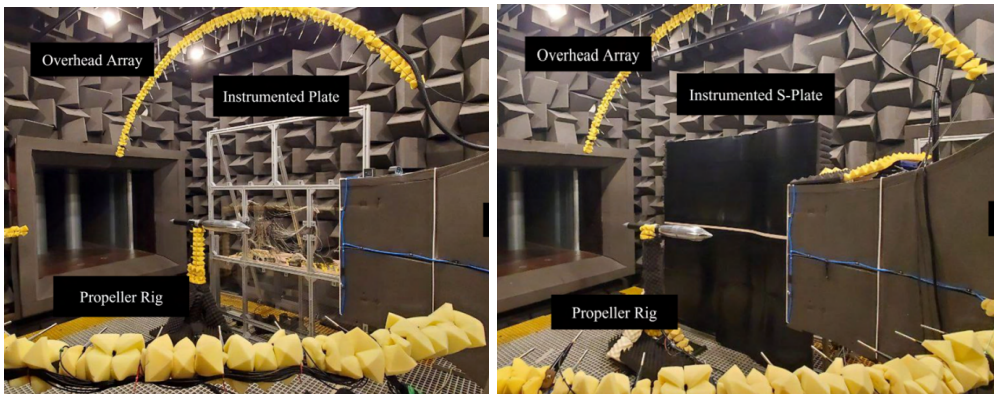
2.1 Configuration A1 and A2

2.1.1 Baseline experimental databases

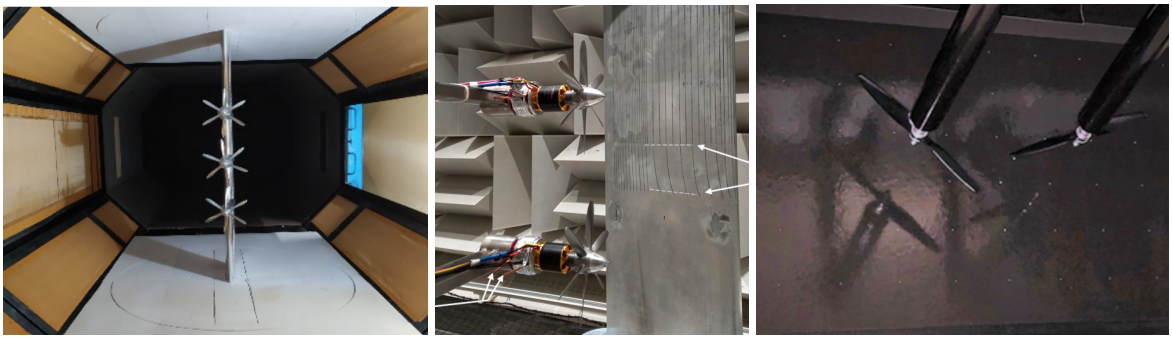
Experimental Aeroacoustic Database BLI Configuration A

- **Authors:** UBRI
- **Description:** This database contains the datasets for the aeroacoustic experiments conducted at the University of Bristol regarding Boundary Layer Ingestion configurations A1 and A2 as part of the H2020 ENODISE project.

  Configuration A1 consists of a propeller ingesting a zero-pressure-gradient boundary layer while A2 is a propeller ingesting an adverse pressure gradient boundary layer in a partially buried configuration. Far-field acoustics are measured using two microphone arcs, near-field measurements consist of surface static pressure and pressure fluctuations. Propeller force and torque is measured using a load cell. Flow-field measurements are obtained through hotwire anemometry.



(a) A1 (b) A2



(c) B1 (d) B2 (e) B3-VTOL



(f) B3-FLAP (g) C

Figure 1: ENODISE configurations

This forms part of Deliverable D3.3, see D3.3 report for further information regarding measurement techniques. Included are descriptive READMEs and instrumentation layouts. The data is in the HDF5 format and comprises mean, spectral, and other processed data types in engineering units.

Now updated with D3.6 to include cleaned CAD models of both A1 and A2 configurations in STEP formats.

- **DOI:** `https://doi.org/10.5281/zenodo.10118963`

Configuration A Experimental Databases

- **Authors:** UTWE
- **Description:** This database contains the datasets for the aeroacoustic experiments conducted at the University of Twente on the H2020 ENODISE project, Task 3.1, Configuration A1 - Wall mounted.

  Configuration A1 consists of a propeller ingesting a zero-pressure-gradient boundary layer. Far-field acoustics are measured using two microphone arrays, to assess directivity and sound pressure levels. Near-field measurements consist of surface static pressure and pressure fluctuations. Propeller force and torque is measured using a load cell. Flow-field measurements are obtained through hotwire anemometry.

  This forms part of Deliverable D3.3, see report for further information regarding measurement techniques. Included are descriptive READMEs. The data is in the HDF5 format and comprises mean, spectral, and other processed data types in engineering units.

- **DOI:** `https://doi.org/10.5281/zenodo.8296736`

2.1.2 Baseline numerical databases

Analytical Aeroacoustic Database BLI Configuration A1 and A2

- **Authors:** DLR
- **Description:** This database contains the acoustic prediction results of DLR for a single operating point of the A1 and A2 configurations investigated in the framework of the European project ENODISE. In these configurations, a single two-bladed propeller is immersed in a boundary layer. The present results can be compared to the measurements carried out by the University of Bristol and the University of Twente for different boundary layer characteristics. The experimental results are saved elsewhere on the ZENODO repository.

  The investigated operating point as calculated in the prediction is: $U_\infty = 33$ m/s, 6500 rpm, advance ratio $J = 1$. The experimental measurements were conducted at a slightly lower freestream velocity.

  The DLR prediction results were obtained using the analytical approach implemented in the DLR in-house program PropNoise coupled to the blade element momentum theory. The calculations were informed by the hot-wire measurements carried out in the boundary-layer as the propeller was removed.

  Refer to the two references cited below to obtain more information about the theory that was applied to obtain the results:

  - S. Guérin, T. Lade, L. Castelucci, I. Zaman, Tonal noise emission by a low-Mach low-Reynolds number propeller ingesting a boundary layer, 29th International Congress on Sound and Vibration, 10-13 July 2023, Prague (CZ).
  - S. Guérin, T. Lade, L. Castelucci, I. Zaman, Broadban noise emission by a low-Mach low-Reynolds number propeller ingesting a boundary layer, Inter-Noise 2023, 20-23 August 2023, Chiba (Great Tokyo), Japan.

The results for tonal and broadband noise are saved separately. The DLR results are saved into an h5 file, which can be read with e.g. python.

- **DOI:** `https://doi.org/10.5281/zenodo.8414424`

Aeroacoustic processing Configuration A1

- **Authors:** UR3
- **Description:** This database encompasses post-processing results derived from experiments conducted at the University of Bristol, specifically focusing on configuration A1. In this research, two distinct boundary layer thicknesses were taken into account, with an analysis comparing the performance of 3-bladed and 5-bladed propellers. The freestream velocity maintained a constant value of 20 m/s, and the chosen advance ratio (J) spanned the range of [0.56, 0.98].

  The dataset includes information such as the Overall Sound Pressure Level, Haystacking Maps, and Spectra Scaling. These metrics are provided for four different scenarios, each involving variations in the number of blades and boundary layer thickness.
- **DOI:** `https://doi.org/10.5281/zenodo.8358762`

Numerical Database Configuration A1 (static propeller)

- **Authors:** ONERA
- **Description:** This database contains the numerical results obtained by ONERA on the configuration A1, using ZDES mode 2 and ZDES mode 3 methods. The ZDES mode 3 approach offers an explicit resolution of the turbulent scales present in the outer region of the flat plate boundary layer and their interaction with the propeller.
- **DOI:** `https://doi.org/10.5281/zenodo.8322105`

Numerical Numerical Aeroacoustic Database Configuration A1

- **Authors:** GPUP
- **Description:** This dataset contains the numerical prediction for A1 configuration as defined in the H2020 ENODISE project (`https://www.vki.ac.be/index.php/about-enodise`). In this configuration, a single two-bladed propeller is immersed in a boundary layer. The present results can be compared to the measurements carried out by the University of Bristol.

  The investigated operating point as calculated in the prediction is:

  $U_\infty = 33$ m/s, RPM = 6500, advance ratio J=1

  The results were calculated using the LES-CABARET method on GPUs. The results presented are preliminary result on coarse grid with the comparison with the experiment for hot-wire and overhead acoustic data at 60-, 90- and 120-degree observer angles.
- **DOI:** `https://doi.org/10.5281/zenodo.8227807`

Numerical Aeroacoustic Database Configuration A2

- **Authors:** GPUP

- **Description:** This dataset contains the numerical prediction for A2 configuration as defined in the H2020 ENODISE project (`https://www.vki.ac.be/index.php/about-enodise`). In this configuration, a single two-bladed propeller is immersed in a boundary layer. The present results can be compared to the measurements carried out by the University of Bristol.

  The investigated operating point as calculated in the prediction is:

  $U_\infty = 27$ m/s, RPM = 6500

  The results were calculated using the LES-CABARET method on GPUs. The results presented are preliminary result on coarse grid with the comparison with the experiment for hot-wire and overhead and side-array acoustic data at 60-120-degree observer angles. In the initial preliminary results, the propeller is located at 1000mm from the inlet.

- **DOI:** `https://doi.org/10.5281/zenodo.8306579`

Numerical Aeroacoustic Database Configuration A2-Ducted

- **Authors:** ONERA

- **Description:** This database contains the numerical results obtained by ONERA on the configuration A2-ducted of the H2020 ENODISE project. In this configuration, a ducted propeller is placed above an S-plate to ingest an adverse pressure gradient boundary layer in a partially buried configuration. The present results can be compared to the measurements carried out by the University of Bristol.

  All following parameters are kept constant in the present simulations:

  Free-stream velocity $u_\infty = 32$ m/s, Propeller tip clearance $d/D = 0.002$, Propeller position inside the duct x/D = -0.0627. Five simulations have been realized by varying the installation (with or without the S-plate) and the propeller rotation speed:

  Isolated propeller (without the S-plate), N = 6000 rpm, 8000 rpm, 11000 rpm, Installed propeller (with the S-plate), N = 6000 rpm, 8000 rpm. The predictions were obtained using the ProLB solver which is based on the Lattice Boltzmann method (`http://www.prolb-cfd.com/`). Aerodynamic and acoustic results are provided for each simulation. One-dimensional results are saved into ASCII column files (.dat extension) while geometry and raw flow extractions are saved into HDF5 CGNS files (.cgns extension). README.txt files are included for detailed description of the data.

- **DOI:** `https://doi.org/10.5281/zenodo.8280145`

2.1.3 Optimized databases without mitigation strategies

Configuration A1 and A2 Numerical Simulation Database

- **Authors:** DLR

- **Description:** Acoustic predictions at 1 overhead array mic and 1 side array mic (90° Mic) for the Configuration A1 and A2 consisting of a propeller and a flat plate (A1) or an S-plate (A2) placed below it.

- **DOI:** `https://doi.org/10.5281/zenodo.13627852`

2.1.4 Optimized databases with mitigation strategies

Configuration A Numerical Databases with Mitigation

- **Authors:** GPUP

- **Description:** This dataset contains the numerical prediction for A2 configuration as defined in the H2020 ENODISE project (`https://www.vki.ac.be/index.php/about-enodise`)

  The dataset contains numerical simulation results for Band-Limited Overall Sound Pressure Level (BL-OASPL) for a rotor operating at inflow velocities of 15 m/s, 27 m/s, 45 m/s, 60 m/s, and 75 m/s with the rotation rate of 6500 RPM. Three setups are investigated with the rotor located at 1000mm, 800mm, and 480mm. The BL OASPL is obtained at 90-degree observer angle in an overhead array. These simulations are based on the experimental setup by the University of Bristol on the investigation of turbulence-ingestion-rotor noise.

- **DOI:** `https://doi.org/10.5281/zenodo.13619109`

Configuration A Experimental Databases with Mitigation

- **Authors:** UTWE
- **Description:** This database contains the datasets for the aeroacoustic experiments conducted at the University of Twente on the H2020 ENODISE project, Task 6.1 (experimental databases with mitigation), Configuration A1 - Wall mounted.

  Configuration A1 consists of a propeller ingesting a zero-pressure-gradient boundary layer. Far-field acoustics are measured using two microphone arrays, to assess directivity and sound pressure levels. Different treatments are used at the flat plate underneath the propeller to attenuate the noise reflected by the plate. Two main strategies are analyzed: tuned quarter-wavelength resonator arrays - to reduce tonal noise - and a broadband noise absorber (metal foam). The quarter-wavelength resonator arrays are tested in different geometrical distributions.

  That forms part of deliverables D6.4, D6.5, and D6.6 - see reports for further information regarding measurement techniques. Included are descriptive READMEs. The data is in the HDF5 format and comprises mean, spectral, and other processed data types in engineering units. CAD files are also added, to properly describe the setup and its components.

- **DOI:** `https://doi.org/10.5281/zenodo.10844534`

2.2 Configuration B1

2.2.1 Baseline experimental databases

Experimental database configuration B1

- **Authors:** TUD
- **Description:** This dataset contains experimental data for aerodynamics and acoustics of configuration B1, which was defined in the H2020 ENODISE project (`https://www.vki.ac.be/index.php/about-enodise`). The measurements were taken in the Low-Speed, Low-Turbulence Tunnel (LTT) at Delft University of Technology, using a Distributed Electric Propulsion (DEP) configuration model that consists of three propellers installed side-by-side on the leading edge of a wing.
- **DOI:** `https://doi.org/10.5281/zenodo.8307371`

2.2.2 Baseline numerical databases

Analytical Aeroacoustic Database Configuration B1

- **Authors:** DLR

- **Description:** This database contains the acoustic prediction results of DLR for a single operating point of the B1 configuration investigated in the framework of the European project ENODISE. In this configuration, three identical propellers with 6 blades are mounted at leading-edge of a wing (puller configuration). The results presented here can be compared to the measurements carried out by the Technical University of Delft, when these are available. The experimental results should be also saved on the ZENODO repository (use the key word ENODISE).

  The investigated operating point as calculated in the prediction is:

  $U_\infty = 30$ m/s, advance ratio J=0.8.

  The DLR prediction results were obtained using the analytical approach implemented in the DLR in-house program PropNoise coupled to the blade element momentum theory.

  The interaction with the wing is accounted for in a simplistic way as explained in the detailed documentation B_documentation.pptx.

  Only, the results for tonal noise are available in this database. Three cases can be investigated separately: a single isolated propeller, 3 distributed propellers, three distributed propellers interacting with the wing. The DLR results are saved in h5 files, which can be read with e.g. Python.

- **DOI:** `https://doi.org/10.5281/zenodo.8414412`

Numerical Aeroacoustic Database Configuration B1

- **Authors:** RWTH

- **Description:** This RWTH dataset contains numerical data for aerodynamics and acoustics of configuration B1, which was defined in the H2020 ENODISE project (`https://www.vki.ac.be/index.php/about-enodise`). In this configuration, three 6-bladed XPROP-S propellers are installed side-by-side on the leading edge of a wing with an airfoil shape of NLF-Mod22(B).

  The investigated operating point is:

  The incoming flow velocity $U_\infty = 30$ m/s, the wing angle of attack AoA = 2 deg, the propeller advance ratio J = 0.8, and the relative blade phase angle between propellers $\Delta\Phi = 0$. Wall-resolved Large eddy simulations (LES) of the configuration are performed based on the multiphysics flow solver m-AIA of RWTH. The far-field noise is predicted by the Ffowcs-Williams and Hawkings (FW-H) method. The data set contains the time-averaged aerodynamic results predicted by the LES simulation and the aeroacoustic results calculated by the FW-H method. It should be noted that the aeroacoustic data is only a preliminary result and it will be updated soon.

  More details of the simulation and measurement setups are explained in the attached document ENODISE_B1_RWTH.pptx.

- **DOI:** `https://doi.org/10.5281/zenodo.8414412`

Numerical Aeroacoustic Database Configuration B1

- **Authors:** ONERA

- **Description:** The ONERA numerical database on configuration B1 deals with the scattering effects of 3 side-by-side puller propellers installed upstream a wing profile in a flow, using an in-house 3-steps-chaining-method. The aim of this work has been to evaluate the ability of the method to predict the scattering effects on the sound pressure level and its directivity.

  The two operating points that have been studied are:

  - $U_\infty = 30$ m/s, J = 0.8, AoA = 2°, with a blade phase-angle $\Phi = 0°$ between the middle and the side propellers

- $U_\infty = 30$ m/s, J = 0.8, AoA = 2°, with a blade phase-angle $\Phi = 10°$ between the middle and the side propellers

The present configuration follows the one described in TUD experimental contribution for configuration B1.

A synthetized description of the numerical method including some important details and results will be included in the file ONERA_B1_configuration.pptx.

The ONERA database contains numerical results about aerodynamic performances (thrust, torque and efficiency). It also includes pressure and sound pressure levels on the arcs microphones positions of TUD experimental configuration. Data are stored in .dat and .plt format files.

- **DOI:** `https://doi.org/10.5281/zenodo.8308001`

Numerical Aeroacoustic Database of Configuration B1

- **Authors:** VKI
- **Description:** This database represents the resultant data from a hybrid methodology consisting of aerodynamic simulations using uRANS and acoustic propagation simulations using FEM. The simulation of both the aerodynamic installation effects and the acoustic installation effects is available. The data from the aerodynamic simulations is given in the .cgns format and are in the Aerodynamic_Results folder. The resulting acoustic directivities from these sources using the FEM-Source Mode method are stored in the Acoustic_Results folder as .csv files. Both folders have a README file available with more details.
- **DOI:** `https://doi.org/10.5281/zenodo.8306236`

2.2.3 Optimized databases without mitigation strategies

Configuration B, Analytical

- **Authors:** DLR
- **Description:** A variation of phase shift and tip gap between adjacent propellers of configuration B1 has been carried out and acoustically investigated.
- **DOI:** `https://doi.org/10.5281/zenodo.13740106`

2.2.4 Optimized databases with mitigation strategies

Configuration B Numerical Databases with Mitigation

- **Authors:** GPUP
- **Description:** This dataset contains the numerical prediction for B1 configuration as defined in the H2020 ENODISE project (`https://www.vki.ac.be/index.php/about-enodise`)

  The dataset corresponds to the Band-Limited Overall Sound Pressure Level (BL OASPL) measurements obtained for Configuration B, focusing on the acoustic performance of propellers under different configurations. Two main setups were tested:

  - Propeller without Serrations: This configuration represents the baseline case where the propeller operates without any modifications to its trailing edge.
  - Propeller with Serrations: This configuration represents the case where the propeller operates with serrations at the trailing edge of the propeller.
- **DOI:** `https://doi.org/10.5281/zenodo.13619831`

2.3 Configuration B2

2.3.1 Baseline experimental databases

Experimental dataset configuration B2

- **Authors:** ECL
- **Description:** This dataset considers experimental aerodynamic and acoustic data for configuration B2 as defined in the H2020 ENODISE project (`https://www.vki.ac.be/index.php/about-enodise`). Wing static pressure, propellers' loads, and far-field sound measurements were performed in an open-jet anechoic facility with a Distributed Electric Propulsion (DEP) configuration model which includes a wing and two side-by-side propellers.
- **DOI:** `https://doi.org/10.5281/zenodo.7925336`

2.3.2 Baseline numerical databases

Numerical Aeroacoustic Database Configuration B2

- **Authors:** SISW
- **Description:** This database contains the aeroacoustic numerical results generated by Siemens Industry Software (SISW) for the B2 configuration investigated in the framework of the European project ENODISE. In this configuration, a six-blade propeller mounted on a support is studied for two operating points with and without flow. The operating points correspond to conditions 65 and 66 of the experimental campaign carried out at Ecole Centrale of Lyon (see H2020 Enodise: Experimental dataset configuration B2 ECL, `https://zenodo.org/record/7925336`).

  The two investigated operating points are:

  - $U_\infty = 0$ studied numerically using detached-eddy simulation combined with finite-element method for acoustics
  - $U_\infty = 22$ m/s studied numerically using large-eddy simulation combined with finite-element method for acoustics

  The SISW aeroacoustic results have been obtained using CFD software Simcenter STAR-CCM+ coupled with acoustic software Simcenter 3D Acoustics. The hydrodynamic and acoustic interactions between the propeller and its support are taken into account in the numerical simulations.

  More information about the numerical setup and results can be found in the documentation included in the database.

  The data are saved in dat files.

- **DOI:** `https://doi.org/10.5281/zenodo.8176756`

Analytical dataset configuration B2

- **Authors:** ECL
- **Description:** This dataset considers analytical data for configuration B2 as defined in the H2020 ENODISE project (`https://www.vki.ac.be/index.php/about-enodise`). The results were calculated using the half-plane Green's function for the convected Helmholtz equation for predicting the sound scattering by trailing edges in the presence of a uniform flow. For mimicking the Distributed Electric Propulsion (DEP) configuration model which includes a wing and two side-by-side propellers measured during the wind tunnel tests, the formalism of source-modes is introduced, from

which the sound field could be expressed uniformly in the whole space. The wing was approximated by a thin plate with zero-thickness. The aerodynamic performance of the propeller was calculated by using a BEMT method.

- **DOI:** `https://doi.org/10.5281/zenodo.8182284`

Auralizations Configuration B2

- **Authors:** ONERA
- **Description:** A quick evaluation of the SISW numerical data (`https://zenodo.org/record/8176756`) and the ECL experimental data (`https://zenodo.org/record/7925336`) was done on an auditory level through auralisations. The in-house auralisation tool FLAURA was used. Sound signatures were evaluated at the microphone positions 17 and 22 (at 90° to the propeller plane) for single and double propeller configurations, with and without flow.

  The database is composed of .wav files, presenting the measured temporal data (ECL) either compared to auralised measured spectral data (ECL) or simulated data (SISW).

  A description of the data is included in a pdf file.
- **DOI:** `https://doi.org/10.5281/zenodo.8321964`

2.4 Configuration B3

2.4.1 Baseline experimental databases

Experimental database configuration B3

- **Authors:** TUD/NLR
- **Description:** This dataset considers experimental aerodynamic and aeroacoustic data for configuration B3 as defined in the H2020 Enodise project (`https://www.vki.ac.be/index.php/about-enodise`):

  Configuration B3 has been split into two subconfigurations (B3-VTOL and B3-FLAP). The available data for two subconfigurations are given below.

  – B3-VTOL (side-by-side rotor setup):
  - Time-resolved 2D2C Velocity fields
  - 4D-PTV tracks

  – B3-FLAP (over-the-wing distributed propulsion):
  - Propeller thrust and torque (for isolated propeller, over-the-wing propeller, over-the-wing distributed propellers)
  - Acoustic microphone data (for isolated propeller, over-the-wing propeller, over-the-wing distributed propellers)
  - Wing static pressures (for over-the-wing propeller, over-the-wing distributed propellers)
  - Time-averaged 2D3C Velocity fields (for over-the-wing propeller)
  - Time-averaged 2D2C Velocity fields (for over-the-wing distributed propellers)
- **DOI:** `https://doi.org/10.5281/zenodo.8283630`

2.4.2 Baseline numerical databases

Numerical aeroacoustic database configuration B3-flap

- **Authors:** NLR
- **Description:** This dataset considers numerical aerodynamic and aeroacoustic data for an over-the-wing mounted propeller, denoted configuration B3-flap as defined in the H2020 ENODISE project (`https://www.vki.ac.be/index.php/about-enodise`).

  The dataset consists of

  - Aerodynamic data: propeller thrust and torque
  - Acoustic data: pressure Fourier modes at 1, 2, and 3 BPF

  both for the isolated propeller and the over-the-wing mounted propeller.

  An overview of the performed numerical simulation and a description of the dataset is given in the included PDF file (ENODISE_NLR_B3_flap_URANS.pdf). This file also includes the aerodynamic data.

  Experiments have also been performed by NLR for this configuration. See `https://zenodo.org/record/8283630` for details and the experimental dataset.
- **DOI:** `https://doi.org/10.5281/zenodo.8319374`

2.5 Configuration C

2.5.1 Baseline experimental databases

Experimental dataset of configuration C

- **Authors:** VKI
- **Description:** This database includes experimental aerodynamic and acoustic data for configuration C as defined in the H2020 ENODISE project (`https://www.vki.ac.be/index.php/about-enodise`). Single and contra-rotating propeller loads and far-field noise were measured in anechoic facility ALCOVES at von Karman Institute for Fluid Dynamics, Belgium. The description of the experimental tests is reported in the associated technical file.
- **DOI:** `https://doi.org/10.5281/zenodo.8334930`

2.5.2 Baseline numerical databases

Numerical Aeroacoustic Database of Configuration C

- **Authors:** VKI/SISW
- **Description:** The hybrid aeroacoustic methodology prediction findings produced by VKI and SISW for configuration C within the scope of the European project ENODISE are contained in this database. In this setup, contra-rotating propellers with and without a shroud are investigated. Simulations of single rotors with and without the shroud are also included. The measurements made at the anechoic facility ALCOVES at VKI (`https://zenodo.org/record/7966211`) and further simulations made by ONERA (`https://zenodo.org/record/8191815`) can be compared to the findings provided here.
- **DOI:** `https://doi.org/10.5281/zenodo.8305812`

Analytical Data Set configuration C

- **Authors:** ECL
- **Description:** Preliminary wake-interaction noise and steady-loading noise estimates for a contrarotating propeller system, using analytical modeling.
- **DOI:** `https://doi.org/10.5281/zenodo.8301188`

Numerical Aeroacoustic Database of Configuration C

- **Authors:** ONERA
- **Description:** This database contains the acoustic prediction results realized by ONERA of the configuration C investigated in the framework of the European project ENODISE. In this configuration, contra-rotating propellers are investigated in static condition with and without shroud. The results presented here can be compared to the measurements carried out by von Karman Institute for Fluid Dynamics in anechoic facility ALCOVES (`https://zenodo.org/record/7966211`).

  The investigated operating point as calculated in the prediction is:

  - Shrouded, RPM=6000, d=3cm.
  - Unshrouded, RPM=6000, d=3cm.

  Predictions were obtained using the ProLB code based on a Lattice Botlzmann Method.
- **DOI:** `https://doi.org/10.5281/zenodo.8191815`

2.5.3 Optimized databases without mitigation strategies

Experimental dataset of configuration C for numerical optimization

- **Authors:** VKI
- **Description:** The database includes acoustic and load measurements performed in the ALCOVES anechoic facility of the von Karman Institute on co-rotating coaxial propellers. This configuration corresponds to Config. C of the ENODISE project. This database has been used for numerical optimization.
- **DOI:** `https://doi.org/10.5281/zenodo.13361815`

2.5.4 Optimized databases with mitigation strategies

Experimental dataset of configuration C with mitigation

- **Authors:** VKI
- **Description:** The multi-rotor Configuration C consists of two co-axial 2-blade Mejzlik propellers (13”x4.2 model) operating at a rotational speed of 6000 rpm. Operating conditions at zero advance ratio are considered.

  Three sets of measurements are provided in the database:

  1. Co-rotating propellers, with 0 and 30◦ clocking angles between the two rotors, and 30 mm distance.
  2. Shrouded contra-rotating propellers, with 25 mm, 30 mm, and 35 mm distance.

3. Shrouded contra-rotating propellers with an Over-The-Rotor liner, with 25 mm, 30 mm, and 35 mm distance.

- **DOI:** `https://doi.org/10.5281/zenodo.12653641`

Numerical Database Configuration C

- **Authors:** SISW
- **Description:** This database contains the acoustic numerical results generated by Siemens Industry Software (SISW) for the propeller configuration C investigated in the framework of the European project ENODISE.

  This configuration consists of two co-rotating co-axial Mejzlik propellers operating at 6000 rpm without flight stream. The effect of varying the clocking angle between the two propellers is studied as a possible noise mitigation strategy.

  The numerical simulations reproduce the conditions of the experimental campaign carried out at von Karman Institute for Fluid Dynamics, Belgium (see H2020 Enodise: Experimental dataset of configuration C with mitigation VKI, `https://doi.org/10.5281/zenodo.12653641`).
- **DOI:** `https://doi.org/10.5281/zenodo.11103828`

3 Zenodo ENODISE community

All the above databases are grouped under the *H2020 ENODISE* community, directly available at the following link `https://zenodo.org/communities/enodise`.