# Dilhara Jayasundara

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## Experience

### Aeroacoustics Engineer
September 2023 - present

Maglev Aero Inc., Boston, MA

- Conducted the **aerodynamic design of an electric ducted fan propulsion system** for eVTOL aircraft.
- Improved **duct augmentation effects** and developed **novel rotor designs** to increase performance in mid to high disk loading regimes using **high-fidelity CFD analyses**.
- Analyzed **open and ducted rotor aerodynamics and acoustics** using low- and high-fidelity aerodynamic solvers such as **BEMT, VPM, LBM, and RANS**, coupled with the **Ffowcs Williams –Hawkings** solver and the **Brooks, Pope, and Marcolini (BPM)** model.
- Developed a low-fidelity **Blade Wake Interaction (BWI) noise prediction model** by analyzing vortex missed distance data obtained from LBM.
- Performed **rotor design optimizations** to reduce noise emissions and increase performance using **genetic algorithms** and **artificial neural networks.**

### Graduate Research Assistant
May 2019 - August 2023

University of Maryland, College Park, MD

- Investigated the aerodynamic and aeroacoustic characteristics of a **wing-mounted propeller** configuration, focusing on the aerodynamic interaction between the propeller, propeller wake, and wing.
- Simulated the aeroacoustics of a **propeller transitioning from hover to forward flight.**
- Analyzed a **six-tiltrotor eVTOL** configuration and a **quadrotor biplane** model in hover and forward flight modes using 3D RANS-based CFD and computational aeroacoustics.
- Collaborated with **Advanced Rotorcraft Technology, Inc. (ART)** to develop a **unified comprehensive aircraft modelling and acoustic analysis toolkit** to support **eVTOL design and optimization.**
- Developed an acoustic post-processing tool to simulate **atmospheric attenuation and human perception of noise.**
- Implemented a **meshing algorithm** to develop robust boundary layer meshes of complex geometries involving concave regions.

### Aeroacoustics Engineering Intern
March - April 2023

Maglev Aero Inc., Boston, MA

- **Aircraft noise estimation** using low- to high-fidelity aerodynamic solvers and Ffowcs Williams–Hawkings - based acoustic solver.
- **Rotor blade optimization** to reduce aircraft noise by performing parametric studies using low- to mid-fidelity tools.

### Graduate Teaching Assistant
August 2018 - May 2019

University of Maryland, College Park, MD

- Courses TA'ed: Aerodynamics and Vibration and Aeroelasticity.
- Conducted occasional lectures, tutorial classes, office hours, and graded assignments of around 50 students in each class.

## Education

### Ph.D. in Aerospace Engineering
August 2023

University of Maryland, College Park, MD, USA

### M.S. in Aerospace Engineering
May 2021

University of Maryland, College Park, MD, USA — GPA: 3.71

### B.Sc. in Civil Engineering
October 2017

University of Peradeniya, Sri Lanka — GPA: 4.00

### AdvDip. in Management Accounting
May 2015

Charted Institute of Management Accountants (CIMA), UK

## Awards and Honors

- **$2^{nd}$ place** at the **Vertical Flight Society (VFS) $3^{rd}$ Annual Design-Build-Vertical** Flight Competition 2023
- **$1^{st}$ place** at the **VFS $38^{th}$ Annual Student Design Competition** – Graduate Category 2021
- **Dean's Fellowship**, University of Maryland 2018
- J.B. Dissanayake Prize for **Industrial Training**, University of Peradeniya 2017
- Bartholomeusz Prize for **Engineering Mathematics**, University of Peradeniya 2017
- E.O.E. Pereira Prize for **Structures**, University of Peradeniya 2017
- M.P. Ranaweera Prize for **Finite Element Methods in Solid Mechanics**, University of Peradeniya 2017
- Ceylon Development Engineering Prize for the **Best Performance in Civil Engineering**, University of Peradeniya 2017

## Selected Publications

- **Jayasundara, D.**, and Baeder, J., "Aerodynamic and Aeroacoustic Analysis of a Quadrotor Biplane Tailsitter" Journal of the American Helicopter Society (under review).
- Arias, P., **Jayasundara, D.** and Baeder, J., "Aeroacoustic Analysis of a Quadrotor Biplane Tailsitter in Climb and Synchrophased Hover", $6^{th}$ Decennial VFS Aeromechanics Specialists' Conference, Santa Clara, CA, February 2024.
- **Jayasundara, D.**, Arias, P. and Baeder, J.D., "Multi-Fidelity Investigation of Noise Control Mechanisms for a Quadrotor Biplane Tailsitter in Forward Flight", AIAA SCITECH Forum, Orlando, FL, January 2024.
- **Jayasundara, D.** and Baeder, J., "Aerodynamic and Aeroacoustic Analysis of a Quadrotor Biplane Tailsitter in Forward Flight", Proceedings of the $79^{th}$ Annual Forum, West Palm Beach, FL, May 2023.
- Yang, S., Ware, C., Batther, J., He, C., **Jayasundara, D.**, and Baeder, J., "eVTOL Rotor Performance and Acoustic Noise Study Using Unified Comprehensive Modeling and Acoustic Analysis", Proceedings of the $79^{th}$ Annual Forum, West Palm Beach, FL, May 2023.
- **Jayasundara, D.** and Baeder, J. "Aerodynamic and Aeroacoustic Analysis of a Hovering Quadrotor Biplane Tailsitter", $10^{th}$ Biennial Autonomous VTOL Technical Meeting and $10^{th}$ Annual Electric VTOL Symposium, Mesa, AZ, January 2023.
- **Jayasundara, D.**, Lee, B., Baeder, J., Goericke, J., Habana, Z., "Aerodynamic and Acoustic Analysis of a Multi-Rotor eVTOL Configuration", AIAA SCITECH Forum, National Harbor, MD, January 2023.
- **Jayasundara, D.**, Jung, Y.S., and Baeder, J., "Aerodynamic and Aeroacoustic Investigation of Wingtip-Mounted Tractor Propeller" Journal of the American Helicopter Society, 2022.
- **Jayasundara, D.** and Baeder, J., "Aeroacoustic Analysis of Non-Periodic Propeller Motions", Aeromechanics for Advanced Vertical Flight Technical Meeting 2022, held at Transformative Vertical Flight Meeting 2022, San Jose, CA, January 2022.
- **Jayasundara, H.M.A.D.,** Koliyabandara, S.M.N.H. and Wijesundara, K.K., "Wind Loads on Tall Buildings: A Comparative Study of the International Wind Codes and Numerical Simulation" Engineer: Journal of the Institution of Engineers, Sri Lanka, 51(3), 2018, pp.31–45
- Koliyabandara, S.M.N.H., **Jayasundara, H.M.A.D.** and Wijesundara, K.K., "Evaluation of Different Turbulence Models in Determining Wind Loads on Tall buildings" Society of Structural Engineers, Sri Lanka-Annual Sessions, 2018.

## Projects

**Collision Detection and Avoidance tool - CODA** 2023

- Developed a surface node normal generation tool that avoids collisions between neighboring normal vectors preventing the formation of negative cell volumes in boundary layer volume meshes.
- Upgraded the nearbody volume mesh generator to improve mesh quality near concave surfaces using the CLOVIS algorithm.

**VFS Design-Build-Vertical Flight Competition -** AMAV 2023

- Designed a **quadrotor tailsitter** with delta wings to achieve higher maneuverability and optimum cruise performance.
- Conducted the **winglet design** to increase the performance of the aircraft.

**VFS Graduate Student Design Competition -** Alicorn 2021

- **Led a five-person team to design a tandem rotor aircraft** for medical equipment delivery for the $38^{th}$ Annual VFS Student Design Competition - graduate category.
- **Streamlined the fuselage** using an extensive CFD analysis to reduce the original aircraft drag by about 50%.
- Conducted the **rotor aerodynamic design** and performed an **aeroacoustic analysis of the aircraft** to ensure low noise emission.

**Aeroacoustic Solver Development -** ACUM-3 2020

- Developed a **computational aeroacoustic solver** to simulate **long duration non-periodic aircraft maneuvers** such as take-off, landing, flyover, and transition between hover and cruise modes.
- **Parallelized** the solver across **multiple CPUs and GPUs using CUDA and MPI** for optimum utilization of computing resources.
- Developed a **new algorithm to parallelize the time dimension** in the Ffowcs Williams - Hawkings acoustic wave propagation equation.

## Professional Activities/Affiliations

- Associate member (former) - VFS Aeroacoustics Technical Committee
- Paper reviewer - VFS Forum 2021, 2022, 2023
- Member - Vertical Flight Society (VFS)
- Associate member - Institute of Engineers, Sri Lanka (IESL)
- Student member - Charted Institute of Management Accountants (CIMA)

## Skills and Proficiencies

- **Areas of Expertise** Aerodynamics, Aeroacoustics, CFD, Rotorcraft Design, Open and Ducted Rotor Design, Structural Mechanics, Structural Dynamics, Fluid-Structure Interactions, Finite Element Method, Management Accounting
- **Programming** MATLAB, Python, C/C++, Fortran, CUDA, MPI, Julia
- **Software and Tools** Altair Ultra FluidX, ANSYS Fluent, SU2, SOLIDWORKS, CATIA, OpenVSP, DUST, FLOWUnsteady, Ducted Fan Design Code (DFDC), XFOIL, Gmsh, ParaView, Tecplot-360, Blender, Pointwise, FLIGHTLAB
- **Miscellaneous** Linux, Shell (Bash/Zsh), Latex, Bitbucket, Git, High-performance computing