Dilhara Jayasundara

Cambridge, MA

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Professional Summary

Innovative and dedicated Aerospace Engineer with a Ph.D. and over 6 years of experience in aerodynamics, CFD, aeroacoustics, and rotorcraft design. Specialized expertise in open and ducted rotor aerodynamics, fluid-structure interactions, structural mechanics, dynamics, vibrations, aeroelasticity, and the finite element method. Proficient in applying machine learning techniques to enhance aerodynamic and acoustic performance.

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 **by more than 20%** using **high-fidelity CFD analyses**.
- Developed a **mid-fidelity ducted rotor simulation tool** by combining axisymmetric 2D RANS and BEMT to **reduce computation time by more than 90%**.
- Developed a low-fidelity **Blade Wake Interaction (BWI) noise prediction model** by analyzing vortex missed distance data obtained from LBM simulations.
- Performed **rotor design optimizations** to **reduce noise emissions by 6 dBA** and **increase performance by more than 10%** using **genetic algorithms** and **artificial neural networks.**

Graduate Research Assistant
May 2019 - August 2023

University of Maryland, College Park, MD

- Developed a **CPU- and GPU-parallel aeroacoustics solver** to simulate **transient aircraft maneuvers** and **reduced steady state computation time by 98%.**
- Investigated the aerodynamic and aeroacoustic characteristics of a **wing-mounted propeller** configuration, focusing on the unsteady aerodynamic interaction between the propeller 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.
- **Reduced the noise footprint** of the quadrotor biplane tailsitter aircraft **by 10 dBA** using rotor synchrophasing.
- 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

- **Estimated aircraft noise footprints** using low- to high-fidelity aerodynamic solvers and Ffowcs Williams–Hawkings - based acoustic solver.
- **Optimized rotor blades** to reduce aircraft noise by performing parametric studies using low- to mid-fidelity tools.

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

B.Sc. in Civil Engineering October 2017
University of Peradeniya, Sri Lanka GPA: 4.00 (Rank-1)

Advanced Diploma in Management Accounting May 2015
Charted Institute of Management Accountants (CIMA), UK

Skills and Proficiencies

- **Programming** MATLAB, Python, C/C++, Fortran, CUDA, MPI, Julia, HTML
- **Software and Tools** Altair Ultra FluidX, ANSYS Fluent, SU2, SOLIDWORKS, CATIA, OpenVSP, DUST, FLOWUnsteady, Ducted Fan Design Code (DFDC), XFOIL, XROTOR, Gmsh, ParaView, Tecplot-360, Blender, Pointwise, FLIGHTLAB
- **Computational Solvers** BEMT, VPM, VLM, RANS, LES, LBM, Ffowcs Williams - Hawkings, BPM
- **Miscellaneous** Linux, Shell (Bash/Zsh), Latex, Bitbucket, Git, High-performance computing

Awards and Honors

- **2nd place** at the **Vertical Flight Society (VFS) 3rd Annual Design-Build-Vertical** Flight Competition 2023
- **1st place** at the **VFS 38th 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

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 38th 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.

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.

Professional Activities/Affiliations

- Aeroacoustics lecturer at eVTOL short course - VFS Forum 2025
- 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)