Amogh Kulkarni

CONTACT INFORMATION

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EDUCATIONAL QUALIFICATIONS

Arizona State University, Arizona, USA *(Jan '22 - Dec '23)*
Master of Science Aerospace Engineering
Specialization: Aerodynamics
Relevant Courses: Advanced Aerodynamics, Computational Fluid Dynamics, Machine Learning, Modern Manufacturing
GPA: **3.47/4**

University of Petroleum and Energy Studies, Dehradun, India *(Aug '15 - May '19)*
Bachelor of Technology Automotive Design Engineering
Specialization: Vehicle Dynamics
Relevant Courses: Automotive Chassis Component Design, Applied Fluid Mechanics, Heat Transfer
GPA: **7.44/10**

RWTH Aachen University, Aachen, Germany *(June '17 - July '17)*
Automotive and Mobility Studies Summer Program
Grade: **A**

PUBLICATIONS / CONFERENCES

Amogh Kulkarni, Timothy Takahashi , *On the Design Implications of Elliptical and Bell-Shaped Lift Distributions*, 2025 AIAA SciTech, January **2025**, Orlando, USA (Currently under review)

- Designed 6 concept wings for elliptical and select non-elliptical lift distribution using potential flow code, VORLAX .
- Leveraged the iterative Excel VBA workflow developed by me to control spanwise twist and design suitable wings with desired transverse loading.
- Developed database of solution iterations and analyzed select VORLAX wings, in Ansys Fluent CFD within an HPC environment to understand span load, lift, drag and leading-edge suction as a function of angle-of-attack .

Lt Cdr Ashok Anand, **Amogh Kulkarni**, Ganapati Joshi, *Effect of trailing edge serrations on-wing performance with and without tubercles* 48th National Conference on Fluid Mechanics and Fluid Power (FMFP), **2021**, BITS Pilani, India December (Proceedings published in FMFP Vol. 3, LNME, Springer)

- Designed asymmetric wings with trailing edge serrations based on bio inspiration from owls.
- Investigated aerodynamic loads on the modified wing at higher AoA in the stall regime.
- Streamlined the CFD workflow for grid independence and employed advanced meshing strategies reducing computational time by **40%**
- The developed trailing edge serrations configuration augmented lift by **15%** at higher angles of attack as compared to baseline.

Sqn Ldr Akshay Joshi, **Amogh Kulkarni**, Ganapati Joshi, *Computational Study of Leading edge tubercles on propeller performance* International Conference on Recent Advances in Computational Techniques (IC-RACT), **2020**, IIT Guwahati, India, (Proceedings published in SSRN, Elsevier)

- Designed a parametric 3D model of small baseline 10"x 4.7" APC slow flyer propeller & modified propeller with leading edge tubercles with constant wavelength and amplitude.
- Modeled the MRF rotating domain in Ansys Fluent and calculated Thrust and torque of the propellers for specific RPM and advanced ratio.
- 3D printed the propellers and built a strain gauge test rig to assess propeller performance by measuring thrust, monitoring motor power feed and prop RPM.
- Modified propeller used **21%** less power at **5%** thrust penalty at lower RPMs in static thrust Wind Tunnel experiements .

C. Dinesh Prabhu, Ganapati Joshi, Ajay Mishra, **Amogh Kulkarni**, *Numerical Analysis of Wave Drag reduction in Cascade Fins by Altering Leading Edge Shape* International Conference on Recent Advances in Computational Techniques (IC-RACT), IIT Guwahati, India, **2020**

- Conducted trade studies on the leading edge shape of 3 element novel cascade fins in supersonic regime, with **15 deg** leading edge displaying overall best wave drag performance
- Designed **7** parametric geometries in CATIA V5 and verified and validated the CFD model with established literature
- Implemented Ansys Fluent scripting, streamlining the workflow to reduce postprocessing time

Amogh Kulkarni, Dhruv Joshi, *Adaptive Resonator for Acoustic Supercharging* SAE International Powertrain, Fuels and Lubricants Meeting **2019**, Texas, USA.
Recipient of Student Travel Research Fund Award

- Presented a concept to improve the breathing capability of a naturally aspirated engine.
- Conceptualized a variable intake resonator which achieves the ram-effect over a wider RPM range facilitating an increase in engine volumetric efficiency, potentially downsizing the engine.

Research Experience

Research Assistant *(Aug '19 - Sept '21)*
Guide: Dr. Ganapathi Joshi, **Defense Institute of Advanced Technology, DIAT, DRDO**

- Led and delivered 4+ design and development projects involving CFD analysis, within set timelines and followed a systematic design and simulation process utilizing Ansys Fluent.
- Generated parametric 3D Surface/CAD development aero geometries using CATIA V5, SpaceClaim for CFD, Wind Tunnel testing and streamlined CFD Workflows with iterative Mesh refinements on Poly-Hex grids, reducing simulation runtimes by **40%** .
- Conducted verification and validation of CFD Methods of Baseline models within **5%** error margin.
- Documented technical reports about project progress post analysis and suggested suitable design changes for improving aerodynamic performance of propellers, wing trailing edge devices of respective projects.

Research Intern *(May '18 - Aug '18)*
Guide: Chief Research Scientist Dr. N.K.S. Rajan, **Indian Institute of Science (IISc)**

- Compiled literature on passive flow control devices, discussing analysis with 2 Aerospace engineering Professors; presented insights on bio inspired (humpback whale) flow control.
- Designed a high camber, baseline wing and a modified wing with inspired leading-edge tubercles in CATIA V5.
- Investigated Aerodynamic loads using Ansys Fluent to compare stall performance of both designs.

Teaching Aide

Aviation Grader, National Aviation Policy *(May '22 - July '23)*
Supervisor: Carol Hannah, Dept. of Aviation, **ASU**

- Prepared written explanations and rubric for assessments on Aviation Policy.
- Evaluated student assignments, providing constructive feedback to enhance learning.

Industry Experience

Jr. Project Engineer *(Feb '24 -Present)*
Supervisor: Chethan Dsouza, Ford Platform Manager, **NYX, Inc**, MI, USA

- Created Bill Of Materials for internal usage and planned inventory material requirement flow.
- Reviewed CAD, assembly drawings of hard trim parts to be injection molded for the Ford Program.
- Calculated dimensional tolerance using ASME Y14.5 and verified components using gauge R & R and Autodesk moldflow deflection reports.
- Created and tracked Engineering change notices(ECNs) in existing and new products.

Skills

Technical : Wind Tunnel Testing, CAD Surfacing, CFD, Meshing, BOM, ASME Y14.5
Programming : Julia, Python, Excel VBA, MATLAB, C++
CFD Tools : ANSYS Fluent, OpenFOAM, ParaView, VORLAX
CAD Tools : SpaceClaim, CATIA V5/3DX (GSD), SOLIDWORKS (CSWA)

Key Projects

Data Driven Prediction of Temperature evolution cases *(May '24 - June '24)*

- Built a model based on Linear Regression, Neural Networks to get a correlation of heat transfer coefficient using OpenFOAM generated dataset.
- Developed Analytical, Naive Regression, Ranz & Marshal Elaborate model and neural networks to assess the quality and parity of Nu number.
- Built a Deep NN to predict temperature evolution in 1D & 2D transient thermal diffusion cases.
- Solved the Diffusion Equation using Finite Difference Method and built a fully connected NN with 2 hidden layers with 128 units each and ReLu activation funtion.

Advanced Aerodynamics: Wing Design *(Aug '22 - Dec '22)*

- Formulated and validated a wing-fuselage combination using VORLAX for a specified transonic regime and flight condition.
- Developed an agile, iterative workflow using Excel VBA to design, analyze desired wing geometries and parse useful data from generated log file.
- Designed swept wing for subcritical flow and performed iterative analysis on wing camber and section geometry to fit transverse elliptical lift distribution.
- Developed a MATLAB code to post-process parsed data to visualize pressure distributions and wing design parameters.

Applied CFD: Thermal Analysis of Internal Flows *(Aug '22 - Dec '22)*

- Performed transient 3D Thermal CFD analysis of internal flow with thermal convection of a prototype heating system to analyze temperature of the outflow.
- Designed the system/computational domain in Spaceclaim and imposed buoyancy effect due to fluid density variation.
- Used NIST formula to calculate operating fluid density and thermal expansion coefficient from operating temperature.

CFD: Flow modeling in 2D mixing chamber *(Jan '22 - May '22)*

- Developed a program in MATLAB, modeling flow in a 2D mixing chamber using non-dimensional 2D Navier-Stokes Equation and mass fraction equation.
- Used the fractional step method with Adams Bashforth/Crank Nicolson with ADI for the momentum equations and the WENO-TVD-RK-3 method for the mass fraction equation.
- Generated flow visualizations of mixing fluid at different Reynolds numbers and measured performance of mixing chamber by time averaged value of mixing quantity.