

Burak A. TUNA, PhD

Aerodynamics Engineer

Contact

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Skills

Aerodynamics (10+yrs)	●●●●●
Fluid Dynamics (10+yrs)	●●●●●
Flow Control (5+yrs)	●●●●●
Heat Transfer	●●●○
Aero-Acoustics (5+yrs)	●●●●○
Wind Tunnel Testing (5+yrs)	●●●●●
Particle Image Velocimetry	●●●●●
Project Management (5+yrs)	●●●●○
Proposal Development (5+yrs)	●●●●○
Experimental Techniques	●●●●●
Structural Analysis (FEM)	●○○○○
Optimization & DOE (4+yrs)	●●●○○

Software

Python – MATLAB – C++	●●●●●
ANSYS - SIMULIA - xFlow	●●●●●
Xfoil – Rfoil – XfoilVG	●●●●●
LabVIEW	●●●●○
PIV Software	●●●●●
Isight – DOE /Optimization	●●●○○

Languages

English	●●●●●
German	●●○○○

Affiliations

AIAA – www.aiaa.org
ASME – www.asme.org
APS – www.aps.org

Service and Leadership

Reviewer:
Physics of Fluids
ASME Journal of Fluids Engineering
Experimental Thermal and Fluid Science
Journal of Hydrodynamics

Awards, Honors & Grants

Successful grant record totaling \$628,000
Institutional Fellowships:
RCEAS, \$21,670 Lehigh University, 2010
Undergrad Studies, \$95,751, TOBB, 2005

Research Interests

Experimental Aerodynamics & Aeroacoustics
Hypersonic Flows

- High Speed Aerodynamics
- Shockwave & Turbulence Interactions
- High Speed Two-Phase-Flows
- High Speed Aero-Thermo-Dynamics
- Nonequilibrium flow physics
- Aero-Optics & Sensing

Shock- & Impact- Driven Transient Flows

Flow Control & Fluid-Structure Interaction

Renewable Energy & Energy Harvesting

Big data in turbulence, renewable energy, aerospace and biomedical engineering.

Teaching Interests

Fluid Mechanics

Aerodynamics

Thermodynamics

Heat Transfer

Biofluid Dynamics

Energy Systems Design

Compressible Aerodynamics

Viscous Flow

Experimental Measurements and Techniques

Experimental Procedures

Engineering Analysis

Experience – Academic & Research & Industrial

Research Scientist

NCPA at University of Mississippi (<https://ncpa.olemiss.edu/>)

2021-11 – Current
Oxford, MS, USA

Working collaboratively with multi-disciplinary teams to develop future aerospace technologies as part of aeroacoustics and aerodynamics R&D processes.

Aerodynamics Engineer

Siemens Gamesa Renewable Energy

2019-09 – 2021-11
Izmir, TURKEY

Working collaboratively with multi-disciplinary teams to develop future blade technologies.

Investigate effects of add-ons (VG, LEP, ...) on power curve, AEP, loads, and noise for both clean and soiled blades to solve performance problems

Solutions Consultant – Aero-Thermal Applications

Dassault Systèmes

2018-08 – 2019-09
Livonia, MI, USA

Interacting with global (North America, Europe, & Asia) ground vehicle OEM customers to provide world class support R&D projects with SIMULIA products.

Lecturer – Fluid Mechanics

University of Waterloo

2017-05 – 2017-09
Waterloo, ON, Canada

Taught lectures on fluid dynamics related to aerodynamics for system design engineer candidates.

Post-doctoral Research Associate

University of Waterloo & General Motors Company

2016-04 – 2018-08
Waterloo, ON, Canada

Developed and implemented experimental / computational methods to investigate the effect of turbulence intensity on oil film evaporation for an internal combustion engine.

Computational Fluid Dynamics Engineer

Turk Traktor – CNH Industrial

2015-08 – 2016-04
Ankara, TURKEY

Utilized ANSYS Fluent (3D) and KULI (1D) to optimize under-hood thermal management.

Post-doctoral Research Associate

Rensselaer Polytechnic Institute

2014-06 – 2015-07
Troy, NY, USA

Partnered with The Boeing Co., Northrop Grumman Corp., AFOSR in various R&D project.

Research Assistant

Lehigh University, Fluids Research Laboratory

2010-09 – 2014-05
Bethlehem, PA, USA

Investigated unsteady shallow flow (boundary layer) instabilities experimentally, theoretically, and computationally via experiments and simulations.

Education

Doctor of Philosophy, Mechanical Engineering,

Lehigh University, GPA: 4.00 /4.00

2010-09 – 2014-05
Bethlehem, PA, USA

Master of Engineering, Mechanical Engineering,

Lehigh University, GPA: 4.00 /4.00

2010-09 – 2013-01
Bethlehem, PA, USA



Summary of Qualifications

- 11+ years of academic / industrial aerodynamics, high-speed flow dynamics, flow control, thermal management, lean process and product development experience in aerospace, automotive, industrial equipment, and renewable energy.
- 5+ years of project management experience in industrial and academic environment with successful grant record totaling **\$628,000**.
- Published in Journal of Fluid Mechanics, Physics of Fluids, Nature Scientific Reports, Experiments in Fluids, ASME Journal of Fluids Engineering, AIAA Journal, International Journal of Heat and Fluid Flow, and Environmental Fluid Mechanics.
- Active reviewer in Physics of Fluids, ASME Journal of Fluids Engineering Experimental Thermal and Fluid Science, Journal of Hydrodynamics journals where each reviewer is carefully selected by the editors based on the reviewer's reputation as an established expertise in their field of specialization.
- Commitment to encourage co-workers to initiate the understanding of a relationship between the theory and the real-world through hands-on experience for efficient solutions related to day-to-day problems of the society.



Awards, Honors & Grants

- **OCE TalentEdge Project Funding:** Experimental Investigation of Surface Properties on Lubricant Vaporization
 - 40% of the project budget of \$165,000 is funded by Ontario Centres of Excellence.
- **Turkish Science Foundation (TUBITAK) Grant:** Optimization of underhood flow field of an agricultural tractors.
 - 40% of the project budget of \$463,000 is funded (50% max) by the government.
- Rossin Doctoral Fellow Award, Lehigh University, 2013. A highly selective nomination given by Faculty of Engineering.
- RCEAS Fellowship, \$21,670, Mechanical Engineering & Mechanics, Lehigh University, 2010.



Details of Professional Experience – Industrial & Research

Aerodynamics Engineer

Siemens Gamesa Renewable Energy (www.siemensgamesa.com)

2019-09 – 2021-11

Izmir, TURKEY

- Developed apps to automate internal processes from calculation to reporting to cut man hour and increase reliability.
- Developed methodology aligned with IEC 61400-1 to evaluate the impact of blade icing on performance and AEP.
- Compared IEC 61400-1 standards for icing with literature to define the validity of IEC compared to real world.
- Investigate effects of add-ons (VG, LEP, ...) on power curve, AEP, loads, and noise for both clean and soiled blades to solve performance problems with the existing wind farms and avoid possible AEP compliance penalties.
- Involved in power curve validation using Penta, Pear, PCL and all other internal Siemens Gamesa tools.
- Involved in power curve certification campaigns and resolve possible issues with performance and AEP compliance.
- Developing methodologies to develop appropriate conversion between different BEM tools inside SGRE.
- Developed app to evaluate aerodynamic loads on blades when they are stored, transporting, and assembling.
- Developing a methodology to process flow visualization images of prototype blades in operation to extract quantitative understanding of aerodynamic performance from qualitative data in a robust way for design validation.

Solutions Consultant – Aero-Thermal Applications

Dassault Systèmes (www.3ds.com)

2018-08 – 2019-09

Livonia, MI, USA

- Developed best practices for fast turnaround and automated CFD simulations of ground vehicles in PowerFLOW.
- Lead validation studies with global industrial partners using PowerFLOW and XFlow software packages.
- Creating numerical simulation based on wind tunnel test results for design validation in digital environment.
- Developed Python based apps to automate post-processing.
- Developed robust methodologies for thermal simulations of heavy trucks.
- Interacting with global (North America, Europe, & Asia) ground vehicle OEM customers to support R&D projects.

Post-doctoral Research Associate

University of Waterloo & General Motors Company (www.fmrl.uwaterloo.ca & www.gm.com)

2016-04 – 2018-08

Waterloo, ON, Canada

- Involved in both academic and industrial (General Motors Co.) R&D projects.
- Developed and implemented experimental / computational methods to investigate the effect of turbulence intensity on oil film evaporation for an internal combustion engine.
- Employed reduced order modelling (ROM) and stochastic estimation to determine flow physics from simultaneous pressure measurements, which could be used for actively control the formation of a laminar separation bubble.
- Performed experimental and theoretical assessment of the influence of coherent structures on energy transfer.
- Optimization of energy harvesters to take advantage of coherent structures found in turbulent boundary layers.
- Supervised and assisted M.Sc. and Ph.D. students with regarding to their academic studies.

Computational Fluid Dynamics Engineer

Turk Traktor – CNH Industrial (www.turktraktor.com.tr)

2015-08 – 2016-04

Ankara, TURKEY

- Proposed an R&D project to build a flow physics laboratory for experimental and computational methods.
- Obtained a government grant of \$463,000 (with 2016 USD to TRY rates) for the proposed R&D project.

- Utilized and combined ANSYS Fluent (3D) and KULI (1D) to simulate designs for underhood cooling package.

Post-doctoral Research AssociateRensselaer Polytechnic Institute (<https://cefpac.rpi.edu/>)

2014-06 – 2015-07

Troy, NY, USA

- Involved in both academic (AFOSR) and industrial (The Boeing Co. & Northrop Grumman Corp.) R&D projects.
- Collaborated with Boeing Actuator Design Team in designing piezoelectric based actuators.

Research AssistantLehigh University, Fluids Research Laboratory (<https://fluidslab.lehigh.edu/>)

2010-09 – 2014-05

Bethlehem, PA, USA

- Conducted experimental and computational analyses to explore effects of dynamic pin and VGs on flow separation.
- National Science Foundation (NSF) Project: *Instabilities in Finite Length Unsteady Shallow Flows***
 - Designed and constructed experimental setups for simulating river flow in order to quantitatively/qualitatively visualize the unsteady three-dimensional flow structure due to shear layer instabilities along the opening of a cavity.
 - Quantified the detailed flow structure at various instability stages, i.e., coupled and uncoupled oscillations.
 - Formulated the mass exchange between the cavity and river by combining the experimental and computational results.
 - Gained hands-on experience two- and three- dimensional Particle Image Velocimetry, pressure measurements, data acquisition, hotwire anemometry, signal processing, hydrodynamic instability, acoustic resonance, and flow-induced vibrations.
 - Experienced in designing and installing experimental setups and motion control systems.

 **Teaching Experience****Lecturer – SYDE 383 Fluid Mechanics**

University of Waterloo

2017-05 – 2017-09

Waterloo, ON, Canada

- Taught fundamental fluid mechanics course.
- Presented informational lectures on topics of interests related to fluid dynamics for system design engineering students.
- Evaluated student performance weekly by assignments and in class activities.

Project Mentor

Rensselaer Polytechnic Institute & University of Waterloo

2014-06 – 2015-07 & 2016-04 – 2018-08

Troy, NY, USA & Waterloo, ON, Canada

- Advised entry / senior level undergraduate, MEng, M.Sc., and Ph.D. students as a postdoctoral associate at Rensselaer Polytechnic Institute and University of Waterloo.
- Presented informational lectures on topics of interests related to advanced flow diagnostic systems.
- Trained junior researchers in setup and analysis of experimental and computational analyses.
- Held one-to-one weekly meetings to discuss research progress and findings, and to revise manuscripts.
- Oversaw experimental apparatus setup process and hands-on instructions to demonstrate the relation between the theory and the real world, plan weekly hardware maintenance.
- Taught problem-solving techniques by simplifying the problems and discussing the phenomenon in a different, known example or application to ensure the topic is thoroughly understood.

Teaching Assistant

Lehigh University (Mechanical Engineering Laboratory I-II & Thermodynamics)

2011&2012&2013&2014 – 01-05

Bethlehem, PA, USA

- Prepared effective problem sets and held in class problem solving session to prepare students for exams.
- Communicated with students with varying levels of understanding of the course material.
- Revised and updated the existing laboratory session instructions by integrating LabVIEW interfaces to introduce digital data acquisition into the course curriculum.
- Taught experimental methods in thermodynamics, fluid dynamics, and material properties.
- Advised students on interpretation of experimental results in relation to the underlying physics and theory.
- Conducted tutorial sessions to supplement weekly lectures by developing step-by-step instructions.
- Evaluated student learning/development by grading assignments, quizzes, laboratory reports, and exams, as well as overseeing their progress in office hours.
- Instructed students on scientific techniques to perform relevant experiments with an emphasis on skills that are transferable to other classes and contexts.

Teaching Development Seminar Series

University of Waterloo, Centre for Teaching Excellence

2016-11

Waterloo, ON, Canada

- Topics covered: Writing Course Curriculum, Teaching Philosophy Statements, How Students Learn, How Students Learn, Assessing Learning, Interactive Learning, Introduction to Course Design

Teaching Training







Lehigh University Teaching Development Course

2013-05

Bethlehem, PA, USA

- Topics covered: Writing Course Curriculum, Teaching Philosophy Statements, How Students Learn, How Students Learn, Assessing Learning, Interactive Learning, Introduction to Course Design

Other Skills & Technical Knowledge

 Theoretical	 Testing Software & Techniques	 Practical / Application
<ul style="list-style-type: none"> Linear Stability / Boundary Layer Theory Proper Orthogonal Decomposition (POD) Reduced Order Modelling (ROM) Lattice Boltzmann Method (LBM) Beam Element Momentum (BEM) Optimization Methods Stochastic Methods 	<ul style="list-style-type: none"> Particle Image Velocimetry (PIV) PIV Software (TSI Insight, LaVision) PLIF & Hotwire Anemometry Flow Visualization (Tuft & Oil & Smoke) Pressure Measurements (Surface & Wake) Thermal Imaging / Transition Detection Load Cell Measurements 	<ul style="list-style-type: none"> Signal Processing / Spectral Analysis Image Processing / Feature Detection Data Reduction / Management Parallel Computing Coded Presentation / Report Generation Monte Carlo Simulation DOE Methods (Latin-Hypercube ...)
 SIMULIA Fluid Solutions	 Scripting	 General
<ul style="list-style-type: none"> PowerDELTA & PowerCASE PowerFLOW & PowerTHERM PowerCOOL & PowerACOUSTICS PowerINSIGHT & PowerVIZ xFlow Isight & Thermoanalytics CoTherm 	<ul style="list-style-type: none"> Python MATLAB Tensor Flow Keras VBA Script C# 	<ul style="list-style-type: none"> Windows Linux Shell /Bash Scripting MS Office Tools VR Enthusiast Mastery in data visualization & graphics

Publications in Refereed Journals

Google Scholar Profile (h-index: 7 & i10-index: 5): <https://scholar.google.com/citations?user=p2HSIjsAAAAJ&hl=en&oi=ao>

- Zhang, X., Tuna, B. A., Yarusevych, S., & Peterson, S. D. (2021). Flow development over isolated droplet-inspired shapes. *International Journal of Heat and Fluid Flow*, 88, 108756.
- Kurelek, J. W., Tuna, B. A., Yarusevych, S., & Kotsonis, M. (2021). Three-Dimensional Development of Coherent Structures in a Two-Dimensional Laminar Separation Bubble. *AIAA Journal*, 59(2), 493-505.
- Pieris, S., Tuna, B. A., Yarusevych, S., & Peterson, S. D. (2020). Flow development upstream of a fence. *International Journal of Heat and Fluid Flow*, 82, 108565.
- Gill, S. J., Tuna, B. A., Yarusevych, S., Li, X., and Shi, F. (2020). Evaporation of Lubricant Films Subjected to Laminar and Turbulent Boundary Layers. *ASME. J. Fluids Eng*
- Tuna, B. A., Kurelek, J. W., & Yarusevych, S. (2019). Surface-Pressure-Based Estimation of the Velocity Field in a Separation Bubble. *AIAA Journal*, 57(9), 3825-3837.
- Ghasemi, A., Tuna, B. A., & Li, X. (2019). Inverse cascade of the vortical structures near the contact line of evaporating sessile droplets. *Nature Scientific reports*, 9(1), 6784.
- Ghasemi, A., Tuna, B. A., & Li, X. (2019). Curvature-induced deformations of the vortex rings generated at the exit of a rectangular duct. *Journal of Fluid Mechanics*, 864, 141-180.
- Tuna, B. A., Yarusevych, S., Li, X., Ren, Y., & Shi, F. (2019). Investigation of the Effect of Inlet Turbulence and Reynolds Number on Developing Duct Flow. *Journal of Fluids Engineering*, 141(5), 051401.
- Ghasemi, A., Tuna, B. A., & Li, X. (2018). Viscous diffusion effects on the self-induced distortions of rectangular vortex rings. *Physics of Fluids*, 30(12), 124101
- Ghasemi, A., Tuna, B. A., & Li, X. (2018). Shear/rotation competition during the roll-up of acoustically excited shear layers. *Journal of Fluid Mechanics*, 844, 831-854.
- Gildersleeve, S., Tuna, B. A., & Amitay, M. (2017). Interactions of a Low-Aspect-Ratio Cantilevered Dynamic Pin with a Boundary Layer. *AIAA Journal*.
- Amitay, M., Tuna, B. A., & Dell'Orso, H. (2016). Identification and mitigation of TS waves using localized dynamic surface modification. *Physics of Fluids*, 28(6), 064103.
- Dell'Orso, H., Tuna, B. A., & Amitay, M. (2016). Measurement of Three-Dimensional Stall Cells on a Two-Dimensional NACA0015 Airfoil. *AIAA Journal*.
- Tuna, B. A., & Rockwell, D. (2015). Shallow flow past a cavity: attenuation of oscillations via a bed perturbation. *Environmental Fluid Mechanics*, 15(1), 179-206.
- Tuna, B. A., & Rockwell, D. (2014). Self-sustained oscillations of shallow flow past sequential cavities. *Journal of Fluid Mechanics*, 758, 655-685.
- Tuna, B. A., Tinar, E., & Rockwell, D. (2013). Shallow flow past a cavity: globally coupled oscillations as a function of depth. *Experiments in fluids*, 54(8), 1586.

Papers in Refereed Conferences

- X. Zhang, B. A. Tuna, S. Yarusevych, S. D. Peterson, 2019, "Flow Development over an Isolated Droplet-Inspired Shape, In Eleventh International Symposium on Turbulence and Shear Flow Phenomena (TSFP11), July 30 to August 2, 2019, Grand Harbour Hotel, Southampton, UK.
- Kurelek, J. W., Tuna, B. A., & Yarusevych, S., 2017, "Three-Dimensional Vortex Development in a Laminar Separation Bubble formed over an Airfoil" In 47th AIAA Fluid Dynamics Conference (p. 3642).
- Tuna, B. A., Li, X., & Yarusevych, S., 2017, July, "Investigation of the Effect of Inlet Turbulence on Transitional Wall-Bounded Flows" In ASME 2017 Fluids Engineering Division Summer Meeting (pp. V01BT06A010-V01BT06A010). American Society of Mechanical Engineers.

4. Gildersleeve, S., **Tuna, B. A.**, Leong, C. M., Clingman, D., & Amitay, M., 2015, "Interactions of a Low Aspect Ratio Dynamic Pin with a Laminar Boundary Layer", In 45th AIAA Fluid Dynamics Conference (p. 2634).
3. DeMauro, E. P., Dell'Orso, H., Sivaneri, V., **Tuna, B. A.**, & Amitay, M., 2015, "Measurements of 3-D stall cells on 2-D airfoils", In 45th AIAA Fluid Dynamics Conference (p. 2633).
2. Dell'Orso, H., **Tuna, B. A.**, & Amitay, M., 2015, "Control of Tollmien-Schlichting Waves Using Piezoelectrically Driven Oscillating Surface". In AIAA Aviation 45th Annual Fluid Dynamics Conference, Dallas, TX.
1. Cetinbas, C. F., **Tuna, B. A.**, Akin, C., Aradag, S., & Uzol, N. S., 2010, January, "COMPARISON OF GASKETED PLATE HEAT EXCHANGERS WITH DOUBLE PIPE HEAT EXCHANGERS", In ASME 2010 10th Biennial Conference on Engineering Systems Design and Analysis (pp. 643-651). American Society of Mechanical Engineers.

Abstracts in Non-Refereed Conferences

12. Zhang, X., **Tuna, B. A.**, Yarusevych, S., & Peterson, S. D. (2019, November). Drag Estimation of Isolated, Surface-mounted, Droplet-inspired Geometries. In APS Division of Fluid Dynamics Meeting Abstracts (pp. Q12-008).
11. Pieris, S., **Tuna, B. A.**, Yarusevych, S., & Peterson, S. (2018, November). Effect of Reynolds number on the separated-reattached flow upstream of a fence. Bulletin of the American Physical Society, 63.
10. **Tuna, B.**, & Amitay, M. (2014, November). Three-dimensional characterization and control of Tollmien-Schlichting waves on a flat plate. In APS Division of Fluid Dynamics Meeting Abstracts (pp. R21-004).
9. **Tuna, B. A.**, Kurelek, J. W., & Yarusevych, S., 2017, "Surface Pressure Based Estimation Of The Velocity Field In A Separation Bubble", 1000 Islands Fluids Mechanics Meeting, April 2017, 1000 Islands, Canada.
8. Kurelek, J. W., **Tuna, B. A.**, Yarusevych, S., 2017, "A Volumetric Reconstruction of Separation Bubble Flow over a NACA 0018 Airfoil", 1000 Islands Fluids Mechanics Meeting, April 2017, 1000 Islands, Canada.
7. Dell'Orso, H., **Tuna, B. A.** & Amitay, M., "Experimental Investigation of three-dimensional stall cells on a NACA-0015 airfoil", 1000 Islands Fluids Mechanics Meeting, May 2015, 1000 Islands, Canada.
6. Gildersleeve, S., **Tuna, B. A.**, Leong, C.M., & Amitay, M., "Interactions of a Low Aspect Ratio Dynamic Pin with a Laminar Flow", 1000 Islands Fluids Mechanics Meeting, May 2015, 1000 Islands, Canada.
5. **Tuna, B. A.** & Amitay, M., "Three-Dimensional Investigation of Active Flow Control of Tollmien-Schlichting Waves", 1000 Islands Fluids Mechanics Meeting, May 2015, 1000 Islands, Canada.
4. Dell'Orso, H., **Tuna, B.**, DeMauro, E., & Amitay, M. (2014, November). Control of Tollmien-Schlichting Waves on a Flat Plate Using a Piezoelectric-Driven Oscillating Surface. In APS Division of Fluid Dynamics Meeting Abstracts (pp. R21-002).
3. Sivaneri, V., **Tuna, B.**, DeMauro, E., & Amitay, M. (2014, November). Formation of Three-Dimensional Stall Cells on Two-Dimensional Airfoils. In APS Division of Fluid Dynamics Meeting Abstracts (pp. G21-003).
2. **Tuna, B. A.**, & Rockwell, D. (2013, November). Self-Sustained Oscillations of Flow Past Sequential Cavities: Effects of Gravity Wave Coupling. In APS Division of Fluid Dynamics Meeting Abstracts (pp. M10-001).
1. **Tuna, B. A.**, Tinar, E., & Rockwell, D. (2012, November). Resonant Oscillations of Shallow Flow Past a Cavity: Exchange Coefficients and Depthwise Variations. In APS Division of Fluid Dynamics Meeting Abstracts (pp. G10-001).