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Engineering & Scientific Consulting

Girguis Sedky, Ph.D.

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Professional Profile

Dr. Sedky is an Aerospace engineer specializing in thermo-fluids, aerodynamics, and aircraft systems. His expertise includes thermal-fluid systems modeling, wind tunnel testing, experiment instrumentation, and aircraft design. He leverages his skills to address challenges across various sectors, including aerospace, the automotive industry, energy, oil and gas, and sports.

Dr. Sedky obtained his PhD at the University of Maryland, College Park where he studied the impact of strong gusts on the aerodynamics and stability of aircraft. He developed a novel experimental set up where he was able to simulate and measure the aerodynamics of wings as they encounter extreme gusts. Using the experimental measurements and insights, he developed analytical aerodynamic models as well as new control strategies to mitigate the destabilizing impact of gusts on flight. After his PhD, he transitioned to Princeton for his postdoctoral studies where he developed a technology inspired by bird feathers to mitigate stall and expand the flight envelope of aircraft. He demonstrated this technology in wind tunnel studies as well as field flight via an autonomous aircraft demonstrator.

Academic Credentials & Professional Honors

Ph.D., Aerospace Engineering, University of Maryland, College Park, 2022

M.S., Aerospace Engineering, University of Maryland, College Park, 2019

B.S., Mechanical Engineering, Louisiana State University, 2017

UMD graduate school Wylie Dissertation Fellowship Aug. 2022

Clark school of Engineering Future Faculty Fellow May 2021

UMD Aerospace Distinguished Alumni (ADA) Scholarship March 2020

Clark school of Engineering Dean' Masters Research Award May 2019

UMD Aerospace Dept. Masters Research Award April 2019

UMD Aerospace Dept. 3 Minute Thesis Competition award April 2019

University of Maryland Aerospace Engineering Fellowship Aug. 2017

Academic Appointments

Postdoctoral Research Associate, Department of Mechanical and Aerospace Engineering, Princeton University, 2022-2024

Graduate Research Assistant, Department of Aerospace Engineering, University of Maryland, College Park, 2017 – 2022

Visiting Researcher, Department of Engineering Science, Cambridge University, 2019

Undergraduate Research Assistant, Department of Mechanical Engineering, Louisiana State University, 2015-2017

Patents

Distributed Passive Stall Mitigation device, US provisional, Princeton Docket # (25-4207)

Publications

Sedky, G., Simon, N., Othman, Wiswell, H., A., Wissa, A., (2023). Distributed feather-inspired flow control mitigates stall and expands flight envelope. *Proceedings of the National Academy of Sciences, PNAS*, 121 (45) e2409268121

Sedky, G., Gementzopoulos, A., Lagor, F. D, Jones, A. R., (2023). Experimental mitigation of large-amplitude transverse gusts via closed-loop pitch control. *Physical Review Fluids*, 8, 064701

Sedky, G., Gementzopoulos, A., Lagor, F. D, Andreu-Angulo, I. & Jones, A. R., (2022). Physics of gust response mitigation in open-loop pitching manoeuvres. *Journal of Fluid Mechanics*. 944, A38.

Sedky, G., Biler, H., & Jones, A. R., (2021). Experimental comparison of a sinusoidal and trapezoidal transverse gust. *AIAA Journal*. 60 (5), 3347-3351

Sedky, G., Lagor, F. D., & Jones, A. R., (2020). Unsteady aerodynamics of lift regulation during a transverse gust encounter. *Physical Review Fluids*, 5(7), 074701.

Sedky, G., Jones A. R., Lagor, F. (2020). Lift regulation during transverse gust encounters using a modified Goman–Khrabrov model, *AIAA Journal*. 58 (9), 3788-3798

Gementzopoulos, A., Sedky, G., & Jones, A. R., (2023). Role of vorticity distribution in the rise and fall of lift during a transverse gust encounter. *Physical Review Fluids*, (Accepted).

Smith, L., Fukami, K., Sedky, G., Jones, A. R., Taira K. A cyclic perspective on transient gust encounters through the lens of persistent homology. *Journal of Fluid Mechanics*. (Under review)

Xu, X., Gementzopoulos, A., Sedky, G. et al. (2023). Design of optimal wing maneuvers in a transverse gust encounter through iterated simulation or experiment. *Theor. Comput. Fluid Dyn*.

Xianzhang Xu, Antonios Gementzopoulos, Girguis Sedky, Anya R. Jones, and Francis D. Lagor. Iterative Maneuver Optimization in a Transverse Gust Encounter. (2023). *AIAA Journal* 61:5, 2083-2099

Biler, H., Sedky, G., Jones, A. R., Saritas, M., Centiner, O. (2020). An experimental investigation of transverse and vortex gust encounters at low Reynolds numbers, *AIAA Journal*. 59 (3), 786-799

Moriche, M., Sedky, G., Jones, A. R., Flores, O., Garcia-Villalba, M. (2020). Characterization of aerodynamic forces on wings in plunge maneuvers, *AIAA Journal*. 59 (3), 786-799

Andrew-Angulo, I., Babinsky, H., Biler, H., Sedky, G., Jones, A. R. (2020). Effect of Transverse Gust Velocity Profiles, AIAA Journal. 58 (12), 5123-5133

Lidard, J., Goswami, D., Snyder D., Sedky, G., Jones, A. R., Paley, D. (2020). Feedback control and parameter estimation for lift maximization of a pitching airfoil, Journal of Guidance, Control, and Dynamics. 44 (3), 587-594

Presentations

“Go with the flow: flow control strategies for unsteady and uncertain environments”. Illinois Institute of Technology. March 19, 2024

“Go with the flow: flow control strategies for unsteady and uncertain environments”. The University of Wisconsin, Madison. March 12, 2024

“A dance of feathers: the fluid dynamics of feather-inspired flow control”. The Society for Integrative and Comparative Biology. January 7, 2024

“Going with the flow: Understanding and controlling unsteady environments”. The Rowland Institute. Harvard University. November 15, 2023

“A dance of feathers: the fluid dynamics of feather-inspired flow control”. American Physical Society (DFD). November 23, 2023

“Experimental mitigation of large-amplitude transverse gusts via closed-loop pitch control”. Physical Review Journal Club. American Physical Society. July 7, 2023

“Transverse gust mitigation via closed-loop control”. American Physical Society (DFD). November 24, 2022

“Physics of gust response mitigation in open-loop pitching maneuvers”. Dept. of Mechanical and Aerospace Engineering. University of California, Los Angeles. May 11, 2022

“Physics of gust response mitigation in open-loop pitching maneuvers”. JHU- UMD-GWU Research Symposium on Environmental and Applied Fluid Mechanics. George Washington University. June 03, 2022

“Physics of gust response mitigation in open- and closed-loop pitching maneuvers”. Dept. of Mechanical and Aerospace Engineering. Princeton University. March 12, 2022

“Experiments in transverse gust mitigation using open-loop pitch maneuvers”. AIAA Scitech 2022 Forum.

“The unsteady aerodynamics of a transverse wing-gust encounter with closed-loop pitch control”. AIAA Scitech 2020 Forum.

“Lift modeling and regulation for a finite wing during transverse gust encounters”. AIAA Scitech 2019 Forum.

Peer Reviews

American Institute of Aeronautics and Astronautics(AIAA) journal

Journal of Fluid Mechanics