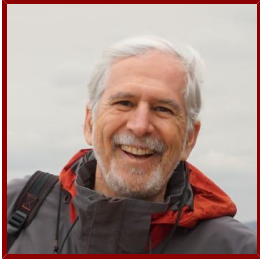


# Stanford

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## Ilan Kroo

Thomas V. Jones Professor in the School of Engineering  
Aeronautics and Astronautics

### CONTACT INFORMATION

- **Administrator**

Corinna Haussecker - Administrative Associate

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**Tel** (650) 723-2107

### Bio

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#### BIO

Professor Kroo's research involves work in three general areas: multidisciplinary optimization and aircraft synthesis, unconventional aircraft, and low-speed aerodynamics. Current research in the field of aircraft synthesis, sponsored by NASA and industry, includes the development of a new computational architecture for aircraft design, and its integration with numerical optimization. Studies of unconventional configurations employ rapid turnaround analysis methods in the design of efficient subsonic and supersonic commercial aircraft. Recent research has included investigation of configurations such as joined wings, oblique wings, and tailless aircraft. Nonlinear low-speed aerodynamics studies have focused on vortex wake roll-up, refined computation of induced drag, the design of wing tips, and the aerodynamics of maneuvering aircraft.

#### ACADEMIC APPOINTMENTS

- Professor, Aeronautics and Astronautics

#### BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- Elected Member, National Academy of Engineering (2013 - present)

#### PROFESSIONAL EDUCATION

- PhD, Stanford University (1983)

#### LINKS

- <http://aero.stanford.edu/People/kroo.html>: <http://aero.stanford.edu/People/kroo.html>

### Teaching

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#### COURSES

##### 2024-25

- Aircraft Design: AA 146A (Aut)
- Aircraft Design Laboratory: AA 146B (Win)
- Sustainable Aviation: AA 260 (Spr)

#### 2023-24

- Aircraft Design: Synthesis and Analysis: AA 241A (Win)
- Aircraft Design: Synthesis and Analysis: AA 241B (Spr)
- Applied Aerodynamics: AA 200 (Aut)

#### 2022-23

- Applied Aerodynamics: AA 200 (Win)
- Atmospheric Flight: AA 141 (Aut)

### STANFORD ADVISEES

#### Orals Evaluator

David Wu

#### Master's Program Advisor

Mariah Barsotti, Joshua Chang, Claire Fitussi, Sean Lin, Sebastian Monsalvo

## Publications

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### PUBLICATIONS

- **Model Reference Control for Reducing Pilot-Induced Oscillation Tendencies** *JOURNAL OF GUIDANCE CONTROL AND DYNAMICS*  
Newton, L. J., Kroo, I. M.  
2024
- **Predicting Pilot-Induced Oscillation Tendencies in Flexible Aircraft Models**  
Newton, L. J., Kroo, I. M., AIAA  
AMER INST AERONAUTICS & ASTRONAUTICS.2024
- **Extended Formation Flight at Transonic Speeds** *29th AIAA Applied Aerodynamics Conference*  
Ning, S. A., Kroo, I., Aftosmis, M. J., Nemec, M., Kless, J. E.  
AMER INST AERONAUTICS ASTRONAUTICS.2014: 1501–10
- **Aircraft Design with Active Load Alleviation and Natural Laminar Flow** *8th AIAA Multidisciplinary Design Optimization Specialist Conference*  
Xu, J., Kroo, I.  
AMER INST AERONAUTICS ASTRONAUTICS.2014: 1532–45
- **Aircraft Route Optimization for Formation Flight** *JOURNAL OF AIRCRAFT*  
Xu, J., Ning, S. A., Bower, G., Kroo, I.  
2014; 51 (2): 490-501
- **Control of Multiple UAVs for Persistent Surveillance: Algorithm and Flight Test Results** *IEEE TRANSACTIONS ON CONTROL SYSTEMS TECHNOLOGY*  
Nigam, N., Bieniawski, S., Kroo, I., Vian, J.  
2012; 20 (5): 1236-1251
- **Metric for Comparing Lifetime Average Climate Impact of Aircraft** *AIAA JOURNAL*  
Dallara, E. S., Kroo, I. M., Waitz, I. A.  
2011; 49 (8): 1600-1613
- **Aerodynamic Performance of Extended Formation Flight** *48th AIAA Aerospace Sciences Meeting and Exhibit Including the New Horizons Forum and Aerospace Exposition*  
Ning, S. A., Flanzer, T. C., Kroo, I. M.  
AMER INST AERONAUT ASTRONAUT.2011: 855–65
- **Multidisciplinary Considerations in the Design of Wings and Wing Tip Devices** *AIAA 26th Applied Aerodynamics Conference*  
Ning, S. A., Kroo, I.

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AMER INST AERONAUT ASTRONAUT.2010: 534–43

- **Two-Level Multifidelity Design Optimization Studies for Supersonic Jets** *AIAA 43rd Aerospace Sciences Meeting and Exhibit*  
Choi, S., Alonso, J. J., Kroo, I. M.  
AMER INST AERONAUT ASTRONAUT.2009: 776–90
- **ENHANCED COLLABORATIVE OPTIMIZATION: A DECOMPOSITION-BASED METHOD FOR MULTIDISCIPLINARY DESIGN** *ASME International Design Engineering Technical Conferences/Computers and Information in Engineering Conference*  
Roth, B. D., Kroo, I. M.  
AMER SOC MECHANICAL ENGINEERS.2009: 927–936
- **Multifidelity design optimization of low-boom supersonic sets** *AIAA/ISSMO 10th Multidisciplinary Analysis and Optimization Conference*  
Choi, S., Alonso, J. J., Kroo, I. M., Wintzer, M.  
AMER INST AERONAUT ASTRONAUT.2008: 106–18
- **Extracting Energy from Atmospheric Turbulence**  
Patel, C., Lee, H., Kroo, I.  
2008
- **Multi-Objective Aircraft Optimization for Minimum Cost and Emissions over Specific Route Networks**  
Geoffrey, C., Bower, Kroo, Ilan, M.  
2008
- **Theoretical and Experimental Investigation of Energy Extraction from Atmospheric Turbulence**  
Patel, C., Kroo, I.  
2008
- **Tip Extensions, Winglets, and C-wings: Conceptual Design and Optimization**  
Ning, S., A., Kroo, I.  
2008
- **Enhanced Collaborative Optimization: Application to an Analytic Test Problem and Aircraft Design**  
Roth, B., D., Kroo, I., M.  
2008
- **Control and Design of Multiple Unmanned Air Vehicles for a Persistent Surveillance Task**  
Nigam, N., Kroo, I.  
2008
- **Multifidelity Optimization Methodology for Incorporating Advanced Technologies into Conceptual Design**  
Fidkowski, K., Kroo, I., Willcox, K.  
2008
- **Multifidelity Design Optimization of Low-Boom Supersonic Jets** *Journal of Aircraft* 0021-8669  
Choi, S., Alonso, J., J., Kroo, I., M., Wintzer, M.  
2008; 45 (1): 106-118
- **A Multifidelity Gradient-Free Optimization Method and Application to Aerodynamic Design**  
Rajnarayan, D., Haas, A., Kroo, I.  
2008
- **Persistent surveillance using multiple unmanned air vehicles** *2008 IEEE Aerospace Conference*  
Nigam, N., Kroo, I.  
IEEE.2008: 88–101
- **NASA Ames Research Center, Probability Collectives for Optimization of Computer Simulations**  
Rajnarayan, D., Kroo, I.  
2007
- **Stanford University, Stanford, CA, Neutral Energy Cycles for a Vehicle in Sinusoidal and Turbulent Vertical Gusts**  
Kroo, I., Lissaman, P., Ventures, D. V., Santa Fe, N. M., Patel, C.

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2007

- **Robust Objective Functions for Sonic-Boom Minimization** *Journal of Aircraft*, 0021-8669  
Makino, Y., Kroo, Ilan, M.  
2006; 43 (5): 1301-1306
- **Two Dimensional Unsteady Aerodynamics of Miniature Trailing Edge Effectors**  
Lee, H., Kroo, I. M.  
2006
- **Conceptual Design of Conventional and Oblique Wing Configurations for Small Supersonic Aircraft**  
Wintzer, M., Sturdza, P., Kroo, I.  
2006
- **Control Law Design for Improving UAV Performance Using Wind Turbulence**  
Patel, C. K., Kroo  
2006
- **Aircraft Family Design Using Decomposition-based Methods**  
Allison, J., Roth, B., Kokkolaras, M., Kroo, I., Papalambros, P. Y.  
2006
- **Optimization Under Uncertainty Using Probability Collectives**  
Rajnarayan, D., Wolpert, D., Kroo, I.  
2006
- **Framework for aircraft conceptual design and environmental performance studies** *AIAA/ISSMO 10th Multidisciplinary Analysis and Optimization Conference*  
Antoine, N. E., Kroo, I. M.  
AMER INST AERONAUT ASTRONAUT.2005: 2100–2109
- **Flight Control with Distributed Effectors**  
Bieniawski, S., Kroo, I., Wolpert, D.  
2005
- **Unconventional Configurations for Efficient Supersonic Flight**  
Kroo, I.  
2005
- **Two-Level Multi-Fidelity Design Optimization Studies for Supersonic Jets**  
Choi, S., Alonso, J. J., Kim, S., Kroo, I. M., Wintzer, M.  
2005
- **Nonplanar Wing Concepts for Increased Aircraft Efficiency**  
Kroo, I.  
2005
- **Aircraft optimization for minimal environmental impact** *AIAA Aircraft Technology, Integration, and Operations Technical Forum (ATIO 2002)*  
Antoine, N. E., Kroo, I. M.  
AMER INST AERONAUT ASTRONAUT.2004: 790–97
- **Discrete, Continuous, and Constrained Optimization Using Collectives**  
Bieniawski, S., Kroo, I.  
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- **Distributed Multidisciplinary Design and Collaborative Optimization**  
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- **Collectives and Complex System Design**  
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- **Optimizing Aircraft Design and Fleet Composition for Environmental Compliance**

Antoine, N., Kroo, I.

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- **Fleet Assignment Using Collective Intelligence**

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- **Aeronautical Applications of Evolutionary Design**

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- **Computational Investigation of Airfoils with Miniature Trailing Edge Control Surfaces**

Lee, H., Kroo, I.

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- **Computational Investigation of Wings with Miniature Trailing Edge Control Surfaces**

Lee, H., Kroo, I.

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- **A Framework for Aircraft Conceptual Design and Environmental Performance Studies**

Antoine, N., Kroo, I.

2004

- **Multi-fidelity Design Optimization of Low-boom Supersonic Business Jets**

Choi, S., Alonso, J., Kroo, I.

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- **NATO Course in Novel Aircraft Design Concepts for the 21st Century** *Instituto Superior Técnico Centro de Congressos, Lisbon PORTUGAL*

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2003

- **Development and Testing of an Experimental Aeroelastic Model with Micro-Trailing Edge Effectors**

Bieniawski, S., Kroo, I.

2003

- **Design-Oriented Aerodynamic Analysis for Supersonic Laminar Flow Wings**

Kroo, I., Sturdza, P.

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- **Aeroelastic design optimization of a two-spar flexible wind-tunnel model** *JOURNAL OF AIRCRAFT*

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- **Flutter Suppression for High Aspect Ratio Flexible Wings Using Microflaps**

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- **Analysis and design of airfoils for use at ultra-low Reynolds numbers** *Conference on Fixed, Flapping and Rotary Wing Aerodynamics at Very Low Reynolds Numbers*

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- **Design and Development of the SWIFT - A Foot-Launched Sailplane**

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- **Supersonic Civil Transport Design Using Collaborative Optimization**

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- **Aeroservoelastic Control Using Redundant Microactuators**

Kroo, I., Prinz, F., Eaton, J.

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- **Development of the Mesicopter - A miniature autonomous rotorcraft**

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- **A 2D multidisciplinary design method for boundary layer ingesting inlets** Rodriguez

David, L., Kroo, Ilan, M.

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- **Multidisciplinary optimization of a natural laminar flow supersonic aircraft** Manning

Valerie, M., Kroo, I.

1999

- **Boundary layer calculations for preliminary design of wings in supersonic flow** Sturdza, Peter, Manning

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- **Aerodynamic Concepts For Future Aircraft**

Kroo, I.

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- **Test Techniques for Small-Scale Research Aircraft** *AIAA 98-2726*

Tigner, B., Kroo et. al., I.

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- **Advanced Configurations for Very Large Transport Airplanes** *AIAA 98-0439*

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- **Small-Scale UAV's for Flight Research**

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- **Aeroelastic Design and Control Gain Scheduling of the Blended Wing Using a Collocation Method** *AIAA 98-4831*  
Holden, M., Tigner, B., Kroo, I.  
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- **UAV Aeroelastic Control Using Redundant Microactuators**  
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- **Concurrent Wing Design and Flight Path Optimization Using Optimizer-Based Decomposition** *AIAA 98-4920*  
Altus, S., Kroo, I.  
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- **The Challenge and Promise of Blended Wing Body Optimization** *AIAA 98-4736*  
Wakayama, S., Kroo, I.  
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- **Response Surface Estimation and Refinement in Collaborative Optimization** *AIAA 98-4753*  
Sobieski, I., Manning, V., Kroo, I.  
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- **Collaborative approach to launch vehicle design** *AIAA/USAF/NASA/ISSMO 6th Symposium on Multidisciplinary Analysis and Optimization*  
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- **Use of the Collaborative Optimization Architecture for Launch Vehicle Design**  
Braun, R., D., Kroo, I., M., Moore, A., A.  
1996
- **Implementation and Performance Issues in Collaborative Optimization**  
Braun, R., Gage, P., Kroo, I., Sobieski, I.  
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- **Highly Nonplanar Lifting Systems** *a hypertext version of a paper presented at the Transportation Beyond 2000 workshop at NASA Langley Research Center*  
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Gage, P. J., Braun, R. D., Kroo, I. M.  
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- **Comparison of Two Multidisciplinary Optimization Strategies for Launch Vehicle Design** *Journal of Spacecraft & Rockets*  
Braun, R., D., Powell, R., W., Lepsch, R., A., Stanley, D., O., Kroo, I., M.  
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- **Use of the Collaborative Optimization Architecture in a Multidisciplinary Design Environment**  
Braun, R., D., Kroo, I., M.  
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- **A Collaborative Approach to Trajectory Optimization**  
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- **Representation issues for design topological optimization by genetic methods** *8th International Conference on Industrial and Engineering Applications of Artificial Intelligence and Expert Systems (IEA/AIE-95)*  
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- **Interplanetary Trajectory Optimization Using a Genetic Algorithm**  
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- **Post-Optimality Analysis in Aircraft Design**  
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- **A Role for Genetic Algorithms in a Preliminary Design Environment**  
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- **AERODYNAMIC AND STRUCTURAL STUDIES OF JOINED-WING AIRCRAFT** *JOURNAL OF AIRCRAFT*  
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- **A Quasi-Procedural, Knowledge Based System for Aircraft Synthesis**  
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Kroo, I., Takai, M.

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