

Isaac Weintraub

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Education

Air Force Institute of Technology

Dayton, OH

Doctor of Philosophy in Electrical Engineering, GPA 3.9/4.0

26 Mar 2021

Dissertation Title: Optimal Defense of High Value Airborne Assets

Committee: Meir Pachter (chair), Richard Cobb, William Baker, Lt. Col. Michael Zollars, Eloy Garcia

University of Texas at Arlington

Arlington, TX

Masters of Science in Electrical Engineering, GPA 3.8/4.0

13 Aug 2011

Rose-Hulman Institute of Technology

Terre Haute, IN

Bachelor of Science (Magna Cum Laude) in Mechanical Engineering, GPA 3.7/4.0

30 May 2009

Minor in Electrical Engineering, Certificate in Robotics

Professional Organizations

American Institute of Aeronautics and Astronautics (AIAA)

Member Since 2011

Senior Lifetime Member

Outstanding Peer Reviewer of JGCD (Letter from Ping Lu, Editor-in-Chief)

2020-2021

AIAA SciTech, Session Chair

2022

Institute of Electrical and Electronics Engineers (IEEE)

Member Since 2009

Senior Member, Controls Systems Society, Robotics and Automation Society, Young Professionals

Tutorial Session Co-organizer, "Introduction to Pursuit Evasion Differential Games"

2020

IEEE Conference on Control Technology and Applications. Session Chair

2020

IEEE Student Conference Chair, *University Texas at Arlington*

2009

IEEE Student Publicity Chair, *University of Texas at Arlington*

2008

Academic Organizations

Tau Beta Pi (Member), Eta Kappa Nu (Member), Pi Mu Epsilon (Member), Order of the Engineer (Member)

Employment

Air Force Research Laboratory

Dayton, OH

Autonomous Controls Branch

29 Mar 2021 - Present

Electronics Engineer, DR-2

- Collaborated and published journal and conference papers with 7 universities in the area of cooperative controls and tactical autonomy
- Supported multi-agent UAV flight tests for multiple missions: cooperative convoy escort, automatic simultaneous arrival, and automatic persistent ISR
- Developed relational maneuvering methods and fielded them in flight simulators located in the aerospace vehicles technology assessment and simulations facility

- Performed system identification and implemented inner-loop controller on an FPGA for the Large Amplitude Multimode Aircraft Simulator (LAMARS) Using Labview
- Lead motion tuning and flying/handling qualities development for classified research programs held in the LAMARS motion simulator
- Lead IADS test and evaluation for Auto GCAS at Edwards AFB for 4 F-16 flights
- Published and reviewed journal and conference publications for the IEEE and AIAA
- Managed the manufacturing facility in Building 145; supported 10 separate AFRL branches, saving over \$3M in manufacturing costs while securing intellectual property of the USAF
- Managed Missile DATCOM for the USAF; supported 7 SBIRs, 28 Commercial Companies and the 51's Nations for developing future weapon systems

- Trained S&E's from AFRL, NASIC, 711th, and other DoD facilities on how to go from napkin concepts to functional prototypes using CAD/CAM, additive and subtractive manufacturing, PCB design, programming, and the design iteration process
- Managed, developed, and marketed a rapid prototyping facility supporting cross DoD facilities

Infoscitex Corporation

Dayton, OH

- Designed and fabricated actuator hardware in the loop testing station for thermal/energy applications resulting in AFRL patent
- Manufactured and tested ultra lightweight flapping wing micro air vehicles resulting in first flight of minimally actuated micro air vehicle with only two actuators
- Wrote proposals for flexible air vehicles and thermal management research resulting in funded task order (RAST)

General Dynamics Information Technology

Dayton, OH

- Supported flapping wing micro air vehicle research for Air Force Research Laboratory resulting in an AFRL patent, journal and conference papers, book chapters, and technical reports
- Developed test and evaluation equipment using high speed cameras and sensors
- Designed printed circuit boards in for control of flapping wing micro-aerial vehicles
- Fabricated flapping wing micro-aerial vehicles using non-traditional methods of manufacturing

Universal Technology Corporation

Dayton, OH

- Designed, manufactured, and tested flapping wing micro-aerial vehicles and conducted bench-level tests resulting in successful proof of concept air table experiments
- Demonstrated the suitability and efficacy of split cycle control laws for flapping wing flight with hardware-in-the-loop tests

Automation and Robotics Research Institute

Fort Worth, TX

- Designed and machined parts for DARPA funded confidential project partnering with Lockheed Martin

- Researched and presented micro-robotic locomotion modules for defense applications
- Lectured, graded work, held lab sessions, and provided regular office hours for Microprocessor Systems undergraduate course
- Opened and provided tutoring for any engineering student during regularly scheduled office hours

ToITest Incorporated

Maumee, OH

Engineering Intern

06 Jun 2006 - 26 Sep 2005

- Worked and designed government and commercial products for a global market
- Produced civil, mechanical, and electrical CAD Models using AutoCAD

Toledo Molding and Die

Toledo, OH

Engineering Intern

06 Jun 2006 - 26 Sep 2005

- Designed and constructed testing equipment for performance and durability testing and evaluation of prototype automotive parts
- Analyzed and reported technical data and specifications to automotive customers

Awards

Gen. Benjamin D. Foulois Award, AFRL/RQQA

2022

For significant and outstanding in-house science resulting in substantial, visible, tangible evidence of a new or improved product, capability or service. Factors considered include significant value added to the engineering body of knowledge or the capabilities of the directorate, engineering excellence, originality, creativity, ingenuity, quality of workmanship and importance to the Air Force. This award recognizes a culmination, multi-year outstanding achievement.

Dr. Courtland D. Perkins Award, AFRL/RQQ

2021

For significant and outstanding in-house engineering resulting in substantial, visible, tangible evidence of a new or improved product, capability or service. Factors considered include significant value added to the engineering body of knowledge or the capabilities of the directorate, engineering excellence, originality, creativity, ingenuity, quality of workmanship and importance to the Air Force. This award recognizes a culmination, multi-year outstanding achievement.

Director's Trophy - Classified Category, AFRL/RQQ

2020

For significant contributions to the RQ mission or image outside of AFRL that had a significant impact and enhanced the credibility of AFRL. This award recognizes significant contributions that can otherwise not be recognized due to its sensitivity.

Director's Trophy - Classified Category, AFRL/RQQD

2019

For significant contributions to the RQ mission or image outside of AFRL that had a significant impact and enhanced the credibility of AFRL. This award recognizes significant contributions that can otherwise not be recognized due to its sensitivity.

Best Technical Presentation, 40th AIAA DCASS

2015

Best Technical Presentation, 39th AIAA DCASS

2014

Judges Volunteer Award, FIRST Tech Challenge

2014

Atmospheric Flight Mechanics Best Paper, AIAA

2013

Local Compass Award, FIRST Tech Challenge

2011

State Compass Award, FIRST Tech Challenge

2011

Bronze Presidential Volunteer Service Award

2011

Jack Fitzler Endowed Scholarship Award, University of Texas at Arlington

2011

Best Student Award, Automation and Robotics Research Institute

2010

Barry M. Goldwater Nominee, Rose-Hulman Institute of Technology

2008

Skills

Hands on Skills

Sheet Metal Fabrication, Carbon Fiber and Fiberglass Molding and Fabrication, Mill, Lathe, Welding (MIG/Stick), Circuit Design and Debugging, CNC Mill, CNC Lathe, Laser Cutting, 3D Printing (SLA FDM SLS), PCB Design and Fabrication, Woodwork, Power Tools and Hand Tools, Automotive Restoration / Fabrication

Technical Skills

Altium, Autodesk Inventor, AutoCAD, Eagle CAD, MasterCAM, Solid Edge, Solid Works, Labview, Labview Real-Time, MATLAB, Simulink, Maple, Microsoft Office, Open Office, Google Docs, PCB Design, Visi-Peps Wire, Adobe Photoshop, Basic, C, C#, G-Code, LaTeX, TikZ

Publications

Dissertation

- [1] Isaac Weintraub “Optimal Defense of High Value Airborne Assets”, Dissertation, Air Force Institute of Technology, 2021. html: <https://scholar.afit.edu/etd/4534/>.

Patent

- [1] Isaac E. Weintraub, Jason Shroyer, Nathan Ritsema, Dillon Sluss, “Synthetic Waypoint Guidance using Bezier Paths”, AFRL Patent Disclosure, 2020.
- [2] Michael W. Oppenheimer, Isaac E. Weintraub, David O. Sigthorsson, David B. Doman, “Methods and Apparatus to Achieve Independent Six Degree Control of Flapping Wing Micro Air Vehicle”, Awarded US Patent 9,428,269 Aug 2015.

Book Chapter

- [1] Isaac E. Weintraub, David O. Sigthorsson, Michael W. Oppenheimer, David B. Doman, “Implementation of Split-Cycle Control for Micro Aerial Vehicles”, In J. H. Kim, E. Matson, H. Myung, P. Xu, F. Karray (Eds.) *Robot Intelligence Technology and Applications 2* (pp 859-876) Springer (2014). doi: 10.1007/978-3-319-05582-4.

Journal

- [1] Dzung Tran, David Casbeer, Eloy Garcia, Isaac E. Weintraub, Dejan Milutinovic, “Ring Formation Maneuver: Double Integrator Kinematics with Input Saturation,” in Journal of Guidance, Control and Dynamics (2021), doi: 10.2514/1.G005925.
- [2] Calvin Kielas-Jensen, Venanzio Cichella, David Casbeer, Satyanarayana Gupta Manyam, Isaac Weintraub, “Persistent Monitoring by Multiple Unmanned Aerial Vehicles Using Bernstein Polynomials”, in Journal of Optimization Theory and Applications (2021), doi: 10.1007/s10957-021-01921-z.
- [3] Isaac E. Weintraub, Alexander Von Moll, Eloy Garcia, and Meir Pachter, “Maximum Observation of a Target by a Slower Observer in Three Dimensions”, Journal of Guidance, Control, and Dynamics 44.3 (2021), pp 646-653. doi:10.2514/1.G005619.
- [4] Isaac Weintraub, Eloy Garica, and Meir Pachter, “Optimal Guidance Strategy for the Defense of a Non-Manoeuvrable Target in 3-Dimensions”, IET Control Technology and Applications 13.11 (2020), pp 1531-1538. doi: 10.1049/iet-cta.2019.0541.

- [5] Eloy Garcia, Isaac Weintraub, David Casbeer, "Adaptive Event-triggered Cooperative Control of Uncertain Networked Systems", IFAC-PapersOnLine 51.2 (2018), pp 82-87. doi:10.1016/j.ifacol.2018.07.092.
- [6] Michael W. Oppenheimer, Isaac E. Weintraub, David O. Sigthorsson, David B. Doman, "Control of a Minimally Actuated Biomimetic Vehicle Using Quarter-Cycle Wingbeat Modulation", Journal of Guidance, Control, and Dynamics 38.7 (2015), pp 1187-1196. doi: 10.2514/1.G000548.
- [7] Isaac E. Weintraub, David O. Sigthorsson, Michael W. Oppenheimer, David B. Doman, "Implementation of Split-Cycle Control for Micro Aerial Vehicles", Advances in Intelligent Systems and Computing 274:859-876, 2014. doi:10.1007/978-3-319-05582-4_76.
- [8] David O. Sigthorsson, Isaac Weintraub, and Christopher Smithson, "Structural Technology Evaluation and Analysis Program (STEAP). Delivery Order 0035: Dynamics and Control and Computational Design of Flapping Wing Micro Air Vehicles", Tech report. DTIC Document ADA582345, 2012.
- [9] Asha J. Hall, Richard A. Roberts, Isaac Weintraub, Jaret C. Riddick, "Flapping Wing Technology for Micro Air Vehicles Incorporating a Lead Zirconate Titanate (PZT) Bimorph Actuator", Tech Report. DTIC Document (ADA564753), 2012.
- [10] Diane Evans and Isaac Weintraub, "Conditional Probability and the 50:50 Lifeline on Who Wants to Be a Millionaire?", Journal of Mathematics and Computer Education, 43.1 (2009), pp69-80.

Conference

- [1] Isaac E Weintraub, Alexander Von Moll, Christian A Carrizales, Nicholas Hanlon, Zachariah E Fuchs, "An Optimal Engagement Zone Avoidance Scenario in 2-D", AIAA SciTech 2022 Forum (AIAA 2022-1587). San Diego, CA, 2022, doi: 10.2514/6.2022-1587.
- [2] Praveen Ranjan, Johnathan Votion, Yongcan Cao, Dzung M Tran, David Casbeer, Isaac E Weintraub, "Energy-aware 3D Leader-Follower Flight Trajectory Optimization for Fixed-Wing Aircraft". AIAA SciTech 2022 Forum (AIAA 2022-2217), doi: 10.2514/6.2022-2217.
- [3] Dzung Tran, David Casbeer, Eloy Garcia, Isaac E. Weintraub, Djan Milutinovic, "Ring Formation Maneuvering with Double Integrator Dynamics", International Conference on Unmanned Aircraft Systems (ICUAS), Athens, Greece, 2021, pp1580-1586, doi:10.1109/ICUAS51884.2021.9476770.
- [4] Isaac E. Weintraub, Eloy Garcia, David Casbeer, and Meir Pachter, "Optimal Evasion in an Active Target Defense Scenario", AIAA SciTech 2021 Forum (AIAA 2021-1881). Virtual Event, 2021. doi:10.2514/6.2021-1881. (Invited Paper)
- [5] Dzung M. Tran, David Casbeer, Eloy Garcia, Isaac E. Weintraub, Dejan Milutinovic, and Satyanarayana G. Manyam, "Ring Formation Maneuver: Single-Integrator Kinematics", AIAA Scitech Forum (AIAA 2021-0978). Virtual Event, 2021. doi: 10.2514/6.2021-0978.
- [6] Satyanarayana G. Manyam, David Casbeer, Isaac E. Weintraub, Dzung M. Tran, Justin M. Bradley, and Swaroop Darbha, "Quadratic Bezier Curves for Multi-Agent Coordinated Arrival in the Presence of Obstacles", AIAA Scitech Forum (AIAA 2021-1879). Virtual Event, 2021. doi: 10.2514/6.2021-1879.
- [7] Isaac E. Weintraub, Meir Pachter, Eloy Garcia, "An Introduction to Pursuit-evasion Differential Games", American Control Conference (ACC), Denver, CO, 2020. doi: 10.23919/ACC45564.2020.9147205.
- [8] Isaac E. Weintraub, Alexander Von Moll, Eloy Garcia, David Casbeer, Zachary J. L. Demers, Meir Pachter, "Maximum Observation of a Faster Non-Maneuvering Target by a Slower Observer", American Control Conference (ACC), Denver, CO, 2020. doi: 10.23919/ACC45564.2020.9147340.
- [9] Isaac E. Weintraub, Zachary J. L. Demers, Jason Shroyer, Nathan Ritsema, Dillon Sluss, "Circular Rejoin in 3D Using Bezier Paths", Conference on Control Technology and Applications (CCTA), Monreal, QC, Canada, 2020. doi: 10.1109/CCTA41146.2020.9206385.

- [10] Isaac E. Weintraub, Richard G. Cobb, William Baker, and Meir Pachter, "Direct Methods Comparison for the Active Target Defense Scenario", AIAA Scitech Forum (AIAA 2020-0612), Orlando, FL, 2020. doi:10.2514/6.2020-0612.
- [11] Garrett Clem, Jay Wilhelm, David Casbeer, Isaac E. Weintraub, and David J. Grymin, "An Intercept and Following Strategy for a Multi-rotor Platform using a Modified Proportional Navigation", AIAA Scitech Forum (AIAA 2019-0683). San Diego, CA, 2019. doi:10.2514/6.2019-0683.
- [12] Isaac E. Weintraub, Eloy Garcia, and Meir Pachter, "An Optimal-Stochastic Aircraft Defense Strategy for the Active Target Defense Scenario", AIAA Guidance, Navigation, and Control Conference (GNC) (AIAA 2018-1336), Kissimmee, FL, 2018. doi:10.2514/6.2018-1336.
- [13] Isaac Weintraub, Eloy Garcia, David Casbeer, and Meir Pachter, "An Optimal Aircraft Defense Strategy for the Active Defense Scenario", AIAA Guidance Navigation and Control Conference (GNC) (AIAA 2017-1917), Grapevine, TX, 2017. doi: 10.2514/6.2017-1917
- [14] Isaac Weintraub, David Sigthorsson, Michael W. Oppenheimer, David B. Doman, "Kinematic Selection for a Tailless Flapping Wing Micro-Air Vehicle", Guidance Navigation and Control Conference (GNC) (AIAA 2016-0892), San Diego, CA, 2016. doi:10.2514/6.2016-0892
- [15] David Sigthorsson, Michael Oppenheimer, David B. Doman, Isaac Weintraub, "Wing Flexibility Induced Control Reversal for Flapping Wing Vehicles: Theoretical Analysis", AIAA Guidance, Navigation, and Control Conference (GNC) (AIAA 2017-1272), Grapevine, TX, 2017. doi:10.2514/6.2017-1272
- [16] David Sigthorsson, Michael Oppenheimer, David B. Doman, Isaac Weintraub, "Wing Flexibility Induced Control Reversal for Flapping Wing Vehicles: Observation and Evaluation", AIAA Guidance, Navigation, and Control Conference (GNC) (AIAA 2017-1273), Grapevine, TX, 2017. doi:10.2514/6.2017-1273.
- [17] Michael W. Oppenheimer, David Sigthorsson, David B. Doman, Isaac Weintraub, "Wing Design and Testing for a Tailless Flapping Wing Micro-Air Vehicle", AIAA Guidance Navigation and Control Conference (GNC) (AIAA 2017-1271), Grapevine, TX, 2017. doi:10.2514/6.2017-1271.
- [18] Michael W. Oppenheimer, Isaac Weintraub, David Sigthorsson, and David B. Doman, "Experimental Measurements of Cycle Averaged Forces for a Flapping Wing Vehicle", AIAA Guidance, Navigation, and Control Conference (GNC) (AIAA 2015-1549), Kissimmee, FL, 2015. doi:10.2514/6.2015-1549.
- [19] Michael W. Oppenheimer, Isaac Weintraub, David Sigthorsson, and David B. Doman, "Quarter Cycle Modulation of a Minimally Actuated Biomimetic Vehicle", AIAA Guidance, Navigation, and Control Conference (GNC) (AIAA 2014-1467), National Harbor, MD, 2014. doi:10.2514/6.2014-1467
- [20] Michael W. Oppenheimer, David Sigthorsson, Isaac Weintraub, Todd J. Smith, Jaderic Dawson, and David B. Doman, "Development of a Flapping Wing Mechanism That Can Produce Lift Greater Than Weight", AIAA Guidance, Navigation, and Control Conference (GNC) (AIAA 2013-5106), Boston, MA, 2013. doi: 10.2514/6.2013-5106.
- [21] David Doman, Michael Oppenheimer, David Sigthorsson, Isaac Weintraub, and Ben Perseghetti, "Wing Velocity Control System for Testing Body Motion Control Methods for Flapping Wing MAVs", AIAA Aerospace Sciences Meeting including the New Horizons Forum and Aerospace Exposition (AIAA-2013-0332), Grapevine, TX, 2013. doi: 10.2514/6.2013-332.
- [22] Stephen Nogar, Jack McNamara, Andrea Serrani, Michael Oppenheimer and David Doman, "Development of a Fundamental Model for Flapping Wing MAVs and Preliminary Validation", AIAA Atmospheric Flight Mechanics Conference (AIAA 2012-4505), Minneapolis, MN, 2012, doi:10.2514/6.2012-4505.
- [23] Michael Oppenheimer, Shorya Awtar, David Sigthorsson, Isaac Weintraub, and David Doman, "Computation of Inertial Forces and Torques Associated with Flapping Wings", AIAA Guidance, Navigation, and Control Conference (GNC) (AIAA 2012-4981), Minneapolis, MN, 2012, doi:10.2514/6.2012-4981.

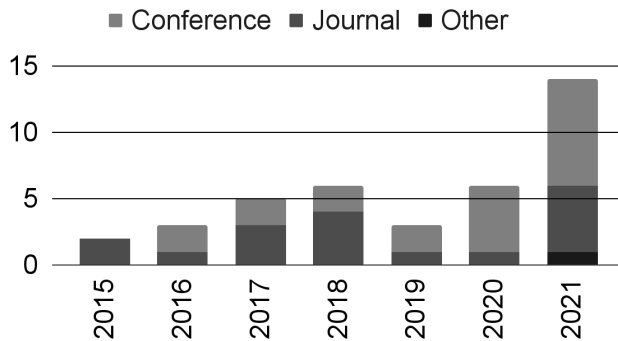
Unpublished Works

- [1] Isaac Weintraub, “Hybrid Propulsion Aerial Systems (HPAS)”, White Paper, Air Force Research Laboratory, 2021.
- [2] Isaac Weintraub and David Grymin, “Autonomous Relational Maneuvering and Overwatch Research (ARMOR)”, White Paper, Air Force Research Laboratory, 2021.

Peer Reviews and Citations

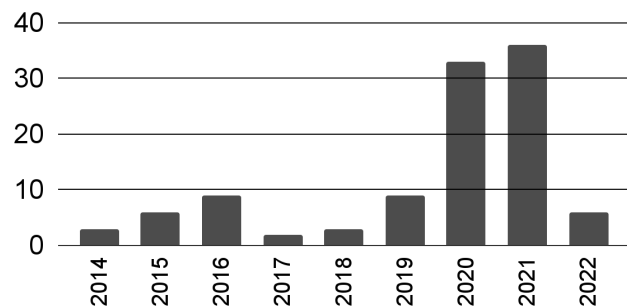
Updated 6 JAN 2022

Peer Reviews



Citations

Citations: 95, h-index: 6, i10-index:2



Museum Pieces

- FWMAV-1 - United States Air Force Museum. Bench level air vehicle used for initial prototyping and testing for flapping wing micro air vehicle wing testing and measurement.
- FWMAV-2 - United States Air Force Museum. Air-Table prototype vehicle used to prove the efficacy and suitability of split cycle control laws for flapping-wing flight.
- FWMAV-3 - United States Air Force Museum. Air-worthy flight vehicle prototype capable of flying controllably in the air with only two actuators.

Interests and Extracurricular Activities

Running Races

2-Marathons, 8-Half-marathons, 5-10Ks, 3-5Ks, 4-Relay races

Ballroom Dance

Arthur Murray bronze level certification

Tae-Kwon-Do

4th degree black belt (instructor); taught women's self-defense classes; won in sparring at numerous local competitions in sparring and patterns; won 3rd place at three international tournaments for sparring

Building Comp

Two-time “Boneyard Build-off” Participant Won 2nd place in 2018

FIRST Robotics

Volunteer Coach, Dayton Regional Stem School

First Tech Challenge Teams #5345 and #4537

Student Participant, Toledo Technology Academy

First Robotics Competition, Team #279

2005 National Championship - Finalist; 2005 Buckeye Regional - GM Industrial Design Award, Regional Winners, and Safety Award Winner; 2004 Great Lakes Regional - Regional Winner; 2004 Buckeye Regional - Regional Winner

Antique Vehicles

Frame off Restoration a 1966 Chevy C10

Restored 1976 Honda CB750; 3rd place in a motorcycle restoration competition

Home Brewing

I have been an avid homebrewer for many years, I make wines, meads, and beer

Piano

I play the piano, albeit I'm a bit rusty

References

- Up to 4 references available on request
- Eligible for Security Clearance and Polygraph