

**Dr. Richard D. Colgren**  
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## EDUCATION

Ph.D. in Electrical Engineering – Systems, minor in Aeronautical Engineering, University of Southern California, 1993. *Dissertation:* “ $H_{\infty}$  Control of Nonlinear Systems using Describing Functions and Simplicial Algorithms” GPA 3.8/4.0.

M.S. in Electrical Engineering, University of Southern California, 1987. Concentration in control systems analysis and synthesis. GPA 3.5/4.0.

B.S. in Aeronautical and Astronautical Engineering, University of Washington, 1982. Concentration in aircraft and spacecraft design. GPA 3.5/4.0.

## WORK EXPERIENCE

### **VIKING AEROSPACE – Lawrence, KS.**

**2005 to Present**

#### **Vice President and Chief Scientist**

Develop and market fixed-wing and rotary-wing Uninhabited Aerial Vehicles (UAVs) and Systems (UASs) achieving customer needs by combining modern design tools and system theory with advanced sensor technologies and state-of-the-art embedded computing. Strive for a leading role as an original equipment manufacturer (OEM) provider of uninhabited aerial vehicles and systems for the world-wide civil and defense UAV market. Achieve strategic partnerships with synergetic impact for development and sale. Intelligent aerospace vehicles and systems represent my major area of multidisciplinary, systems oriented research and development. Key topics I am pursuing to enable Uninhabited Air Vehicles (UAVs) as viable systems are: reliable autonomous and nonlinear control, excellent measurement and estimation systems and techniques, and efficient models. Accomplishments include:

- Develop and Support Programs on Autonomous Control and UAV Avionics. Directed Research, Development, and Production Programs on Fixed Wing and Rotary UAVs and their Flight Control Systems.
- *Founder and Chair of the Kansas UAV Consortium.* Worked to foster UAV development and testing efforts within the State of Kansas between Industrial, Government, and Academic institutions.
- Conduct Flight Test and Autonomous Control Systems Development and Production Programs. Develop and Produce Air Vehicle Designs, Conduct UAV Operations, and Research Programs on Aerospace Technologies.

### **UNIVERSITY OF KANSAS – Lawrence, KS.**

**2003 to 2010**

#### **Associate Professor, Department of Aerospace Engineering**

My research focused on cutting-edge embedded control technologies to enable the realization of autonomous vehicles capable of conducting safe operations in conjunction with other vehicles, including formation flight. The thrust of my research was on developing a framework for real-time vehicle management systems to obtain self-awareness, external awareness, and perform intelligent decision-making based on that awareness. This research has major ties into aerospace system applications. The use of UAV helicopters at the Lawrence Airport Flight Research Facility was to develop and verify these autonomous control technologies, to identify and verify dynamic vehicle models, and to train students in rigorous flight test procedures for programs including the NSF CREStS Meridian UAV being constructed for polar research. I have spent many years applying advanced mathematical theory such as  $H_{\infty}$  control to design projects, and have used describing functions and dynamic inversion to rigorously generate adaptive controllers. I worked with engineers from NASA Dryden and the Air Force Flight Test Center on low cost methods for flight testing. These techniques and methods have direct application to both experimental general aviation aircraft and to UAV flight testing. They use inertial and GPS sensors with minimal modifications to the vehicle. Estimation techniques are used to correct for winds and derive air data parameters. Accomplishments include:

- Updated and Taught Existing Courses on: 1) Digital Flight Control Systems (AE 753), 2) & 3) Advanced Aerospace Systems Design I and II (AE 721 and 722), .4) & 5) Aerospace Systems Design I and II (AE 521 and 522), and 6) Flight Dynamics I (AE 550).

- Direct Graduate Students in topics in the following classes: 1 & 2) Ph.D. Dissertation (AE 996) and Ph.D. Dissertation Research (AE 895), 3) M.S. Project (AE 896), 4) M.S. Thesis (AE 895), and 5) Special Problems in Aerospace Engineering (AE 790).
- Direct Undergraduate Students in topics on: 1) Special Problems in Aerospace Engineering (AE 592).
- Developed new AE 211 *MATLAB, Simulink, and Stateflow* Course (2007 to 2008).
- Developed new AE 755 *Robust Control of Nonlinear Systems* Course (2006 to 2007).
- Aerospace Short Course Program, Courses and Methods for Remote Presentation (2004 to 2006).
- Developed new MATLAB/Simulink Continuing Education Course (2004 to 2006).
- Arranged MOA for UAV Flight Research at Smoky Hill including new UAV Airport (2005 to 2006).
- Developing COAs for UAV Flight Operations with the FAA (2004 to 2009).
- Conducted Consulting Work for: American Institute of Aeronautics and Astronautics (Review Paper and Book Proposals), Honeywell KCP (Technology Briefings on UAVs), Rocketplane LLC (Organized and Lead a Red Team Review of the Vehicle and Flight Management Systems), American GNC Corporation (Provide Controls Consulting on SBIR), AeroArts LLC (Support SBIR Proposals).

**LOCKHEED MARTIN AERONAUTICS COMPANY - Palmdale, CA.**

**1984 to 2003**

**Senior Staff Engineer: Lead Vehicle Sciences and Systems Engineer, C4ISR and UAV Programs.**

Conceived and conducted advanced research and development in vehicle systems and modeling. Directed and facilitated a variety of Vehicle Management and Flight Control System Projects. Duties included: Team Building, Technical Management, Flight and Accident Investigation, Product Improvement, Systems Development and Integration, and Research and Development. Accomplishments include:

- Flight Control Systems Analysis Lead on Reconnaissance and Advanced Programs.
- Flight Control Systems Lead on the Quiet Supersonic Platform Program.
- Integrated Product Team (IPT) Lead for Specialist Support for DarkStar directing analysis of control law redesign and alternative control surfaces for mode suppression including ground and flight testing.
- Vehicle Management Systems IPT Lead for the Lockheed Martin UCAV and Tier II+ Programs.
- Evaluated parameter identification methods for ground and flight testing.
- Lead for ground and flight testing of the autopilot, air data, and actuation system upgrades to the U-2.
- Conducted inner and outer loop design and trajectory analysis on U-2S.
- Developed U-2 Cockpit Procedures Trainer navigation and guidance algorithms and simulation.
- On-site and off-site accident investigation work on DarkStar, U-2, F-117A.
- Program Manager/Project Engineer on numerous Contracted and Internal Research and Development (CRAD/IRAD) Projects:
  - DARPA Mixed Initiative Control of Automa-teams (MICA) Proposal.
  - USAF Control of Multi-Mission UAV Systems (CMUS) Proposal.
  - Air Vehicle Technology Integration Program (AVTIP) Proposal.
  - DARPA Software Enabled Control (SEC) Technologies for Reliable Autonomous Control (TRAC).
  - Multivariable Control Theory CRAD, leading to USAF Modern Control System Design Guidelines.
  - Aeroservoelastic Modeling Classified CRAD.
  - Model Reduction Methods IRAD.
  - Lockheed Flight Controls Workstation IRAD.
- Development of low order equivalent systems techniques for handling qualities prediction successfully applied to the F-117A, and used on F-22, U-2, P-7, and a variety of other programs.
- Replacement of complex aileron to rudder interconnects with simpler PXQ system on F-117A.
- Instructor for Skunk Works and Lockheed Technical Institutes. Developed and implemented training programs used across company sites.
  - MATLAB for Engineers.

- MATLAB and Simulink.
- Aircraft Conceptual Design – Flight Controls.
- Performed trade studies, preliminary and advanced design, and flight test evaluation on various programs (including F-117A, F-22, A-X, JAST, P-7, HL-20, CRV, U-2, SR-71, Tier II+, Tier III, DarkStar, JSF, A-4, JASSM, UCAV, X-33, SOV, QSP, Aquila, Wraith,  $\mu$ UAV, and other UAVs).
- Past Software Subcommittee Chairman for Corporate Task Force.

**NORTHROP CORPORATION - Pico Rivera, CA.**

**1982 to 1984**

**Flight Controls Engineer**

Conducted Flight Controls Design, Analysis, and 6 DOF Simulation of Advanced Airborne Systems including the B-2 and the F-20. Analyzed and implemented leading edge technologies in real-time handling qualities simulators and embedded digital flight control systems. Accomplishments include:

- Developed frequency domain handling qualities methods used on the F-20 program.
- Created automated method for processing aerodynamic data for implementation in the B-2 simulations, resulting in significant time and cost savings.
- Participated in the development of the B-2 stability augmentation system, improving performance.

Designed angle-of-attack and sideslip limiters, increasing the flight safety of the B-2.

**Other Academic Appointments**

2004 to 2007: Adjunct Professor in Electrical Engineering, University of Texas, San Antonio, Assist Electrical Engineering Department in establishing minority serving institutional doctoral program and graduate flight vehicle controls research program.

2003 to 2007: Adjunct Professor in Mechanical Engineering, California State University – Los Angeles, Los Angeles, CA. Assist Mechanical Engineering Department in establishing minority serving institutional masters degree program in hypersonic flight vehicle modeling research and air vehicle design, including teaching a course on air vehicle design with assistance from another California State University – Los Angeles professor.

2002 to 2003: Adjunct Professor, Embry-Riddle Aeronautical University, Palmdale, CA. Undergraduate instructor of physics and mathematics courses.

2000 to 2003: Adjunct Professor, University of Phoenix, Lancaster, CA. Undergraduate mathematics instructor. Courses include statistics and college algebra.

1999: Lecturer, AIAA Workshop – “Aerospace Structural Dynamics and Control” with Dr. Jurek Sasiadek of Carleton University.

1998 to 2003: Adjunct Professor in Electrical Engineering, University of Southern California, Los Angeles, CA. Graduate systems instructor. Developed and taught courses on linear systems theory. Additionally, developed an experimental graduate course on the tradeoff of performance versus robustness goals in control systems design.

1996 to 1997 and 2002: Associate Professor in Computer Science, Chapman University, Edwards AFB, CA. Instructor of undergraduate computer architecture and statistics courses.

1996: Lecturer, National Test Pilot School – Mojave, CA. Short Course instructor in control systems design and analysis tools (MATLAB and Simulink). Taught international engineers and pilots in course and tutoring formats.

1995 to 2003: Adjunct Professor in Mathematics and Science, Antelope Valley College, Lancaster, CA. Undergraduate mathematics instructor. Courses include statistics, calculus, pre-calculus, algebra, beginning algebra, and remedial mathematics.

1993 to 1996 and 2002: Associate Professor in Electrical Engineering, California State University - Fresno, Edwards AFB, CA. Graduate Electrical Engineering course instructor in control systems, communications engineering, stochastic processes and random variables, and multivariable control.

1984 to 2003: Senior Staff Engineer, Lockheed Technical Institute, Palmdale, CA. Developed and taught graduate level courses as instructor for Skunk Works and Lockheed Technical Institutes on "MATLAB for Engineers," "MATLAB & Simulink," and "Aircraft Conceptual Design – Flight Controls."

**ACADEMIC RESEARCH (Total = \$2,421,547)**

**Externally Funded National Government Grants (Subtotal = \$807,917):**

- 1) American GNC Corporation (NASA Stennis Space Center), \$50,000, "Health and Maintenance Status Determination for Predictive Fault Diagnosis System," 2 graduate students supported, 1 January 2009 to 30 January 2010.
- 2) NSF Center Grant, Co-PI at 2.5% credit on \$19,797,469 (\$494,937 for Dr. Colgren's portion), "Center for Remote Sensing of Ice Sheets (CReSIS)," PI: Gogineni (KU), multiple Co-PIs, 2 of my graduate students supported, February 2005 to January 2010.
- 3) NSF CReSIS Center Educational Grant, \$8,000, "Cryohawk One-Half Scale Flight Demonstrator UAV," 5 students partially supported, 16 August 2005 to 15 May 2006.
- 4) Quoin International (U. S. Navy), \$10,000, "Flywheel ACS Integrated KV – System Evaluation, Feasibility and Direction Advisement," 1 graduate student supported, 6 December 2004 to 28 March 2005.
- 5) CSU-LA/USC (NASA Dryden/USAF Research Laboratories), \$36,600, "Generic Hypersonic Vehicle Modeling and Simulation," PI: Maj Mirmirani (CSU-LA), 1 graduate student supported, 19 August 2004 to 15 May 2007.
- 6) KalScott Inc. (U. S. Navy), \$21,000, "Stand-off Precision Employment of ASW Sensors," 1 student supported, 1 July 2004 to 31 Jan. 2005, terminated Oct. 2004.
- 7) DoD (Oak Ridge National Laboratory and Sandia National Laboratory), \$25,000, "Missile Technology Control Regime Annex Handbook, Phase VI," 1 student supported, 16 August 2005 to 15 May 2006.
- 8) DoD (Oak Ridge National Laboratory and Sandia National Laboratory), \$40,000, "Missile Technology Control Regime Annex Handbook, Phase V," 2 students supported, 1 February 2005 to 15 August 2005.
- 9) DoD (Oak Ridge National Laboratory and Sandia National Laboratory – Note that multiple Homeland Security related awards mostly related to Export Control and Technology Assessments for two National Laboratories were made under amendments to this contract), \$19,047, "Missile Technology Control Regime Annex Handbook, Phase IV," 2 students supported, 1 September 2004 to 31 January 2005.
- 10) DoD (Sandia National Laboratory), \$30,000, "Missile Technology Control Regime Annex Handbook, Phase III," 2 students supported, 16 June 2004 to 15 May 2005.
- 11) DoD (Sandia National Laboratory), \$15,000, "Missile Technology Control Regime - Annex Handbook, Phase II," 3 students supported, 1 February 2004 to 15 June 2004.
- 12) DoD (Sandia National Laboratory), \$25,000, "Missile Technology Control Regime - Annex Handbook," 5 students supported, 15 October 2003 to 31 January 2004.
- 13) NASA, Co-PI at 13% credit on \$74,570 (\$10,000 for Dr. Colgren's portion), "UAV Technology Roadmap for Earth Science Enterprise," PI: Gogineni (KU), multiple Co-PIs, 1 June 2004 to 31 December 2004.
- 14) KalScott Inc. (NASA Dryden), \$23,333, "Thermal Soaring Technologies for UAVs," 1 April 2004 to 30 September 2004.

**Externally Funded National Industrial Grants (Subtotal = \$165,254):**

- 1) Discover Channel/Half Yard Productions, "Scorpion Ballista Testing," \$1,218, 1 May 2007 to 20 July 2007.
- 2) Lockheed Martin – ADP, \$20,000, "Advanced Prototyping for the Marsplane," 7 March 2007 to 15 August 2007.
- 3) Space Age Control, \$7,000, "UAV Air Data Probe Wind Tunnel Testing," October 2006 to October 2008.
- 4) American GNC Corporation, \$6,371, "Autonomous TALON Ground Vehicle, Part 3," 1 student supported, 1 November 2006 to 31 May 2007.
- 5) American GNC Corporation, \$5,529, "Autonomous TALON Ground Vehicle, Part 2," 1 student supported, 16 August 2006 to 31 October 2006.
- 6) American GNC Corporation, \$122,836, "Autonomous TALON Ground Vehicle," 1 student supported, 18 August 2005 to 15 August 2006.
- 7) Grinnell/eFishAntSea, \$2,300, "UAV Ground Station," 1 student supported, June 2004 to August 2004.

**Externally Funded State Grants (Subtotal = \$1,110,193):**

- 1) Kansas NASA KSGC Program, \$18,835, "Statewide Undergraduate Flight Testing of the Cryohawk Stability and Control Demonstrator," 1 graduate and 3 undergraduate students supported, 1 June 2008 to 31 December 2009.

- 2) ADMRC, PI at 80% credit on \$204,000 (\$163,200 for Dr. Colgren's portion), "The Development of a Vibration-Based Energy Harvesting System for Structural Health Monitoring Sensor Suites Utilizing Post-Buckled Precompressed Piezoelectric Elements," Co-PIs: Barrett-Gonzalez (KU), 2 students supported, 1 January 2008 to 31 December 2009.
- 3) Transportation Research Institute, \$11,106, "Innovative Avionics Systems for UAVs," 4 undergraduate students supported, 18 May 2007 to 23 August 2007.
- 4) Kansas NASA KSGC Program, \$32,914, "Hands-On Experience in the Modeling and Simulation of a Generic Hypersonic Vehicle," 15 May 2007 to 30 December 2007.
- 5) Kansas NASA KSGC Program, \$21,631, "Twin Fuselage Airplane Design, Construction and Flight Test of a Stability, Control and Performance Demonstrator," 9 May 2007 to 30 December 2007.
- 6) Kansas NASA KSGC Program – Statewide Design Project, \$55,000, "Mars Airplane: Design, Construction, and High-Altitude Test of a Stability, Control, and Performance Demonstrator," 1 November 2006 to 15 May 2007.
- 7) Kansas NASA EPSCoR Program – Instrumentation Grant, \$85,740, "Time Triggered Network Protocol for UAVs," 1 October 2006 to 31 May 2007.
- 8) Kansas NASA EPSCoR Program, 100% credit on \$72,000, "Modular Wireless Avionics System for Autonomous UAVs, Augmentation Grant," Co-PIs: Schinstock (KSU), Thompson (KSU), Lookadoo (PSU), 3 of my students supported, 2 May 2006 to 30 December 2006.
- 9) ADMRC (Note: 3 proposals submitted and competitively reviewed, one each year), \$156,000, "Analysis of IEEE 802.11a/b/g Protocol Robustness for Essential Data Applications" 2 students supported, 1 January 2006 to 31 December 2008.
- 10) Kansas NASA EPSCoR Program, PI at 70% credit on \$690,832 (\$483,582 for Dr. Colgren's portion), "Modular Wireless Avionics System for Autonomous UAVs," Co-PIs: Chen (KU), Schinstock (KSU), Thompson (KSU), Lookadoo (PSU), 4 of my graduate students supported, 1 December 2004 to 31 May 2007.
- 11) Kansas NSF EPSCoR Program, \$10,185, "Planning Grant, Intelligent Vehicle Systems Center," 1 April 2004 to 31 June 2005.

**Internally Funded University, School, or Department Grants (*Subtotal* = \$338,183):**

- 1) KU URA Educational Grant, \$1,250, "Cryohawk One-Half Scale Flight Demonstrator UAV," 1 student supported, August 2007 to December 2007.
- 2) KU URA Educational Grant, \$1,250, "Cryohawk One-Half Scale Flight Demonstrator UAV," 1 student supported, May 2007 to August 2007.
- 3) KU Graduate School, \$5,642, "Generic Hypersonic Vehicle Modeling and Simulation – Tuition Grant, Shah Keshmiri," 1 student supported, August 2006 to May 2007.
- 4) KU Completion GRF, \$5,441, "Generic Hypersonic Vehicle Modeling and Simulation," 1 student supported, 1 July 2006 to 30 June 2007.
- 5) University of Kansas, \$10,000, "7th International Symposium on Quantitative Feedback Theory and Robust Frequency Methods," August 2006.
- 6) KUAE Educational Grant, \$2,000, "Cryohawk One-Half Scale Flight Demonstrator UAV," 16 August 2005 to 15 December 2005.
- 7) KU Graduate School, \$3,000, "Generic Hypersonic Vehicle Modeling and Simulation – Tuition Grant, Shah Keshmiri," 1 student supported, August 2005 to May 2006.
- 8) KU School of Engineering, \$3,000, "Generic Hypersonic Vehicle Modeling and Simulation – Shah Keshmiri," 1 student supported, August 2005 to May 2006.
- 9) KU Graduate School, \$10,600, "Generic Hypersonic Vehicle Modeling and Simulation – Tuition Grant, Shah Keshmiri," 1 student supported, August 2004 to May 2005.
- 10) KU School of Engineering - Start-Up Funds, \$296,000, "UAV Laboratory," 5 graduate students partially supported, September 2003 to December 2008.

**SCHOLARLY WORK (134 Total Publications)**

My research is within a very interdisciplinary research field requiring multidisciplinary teams to successfully perform research. As such, there are often several authors with leadership roles in the various elements of the research. In addition, the authors come from a number of fields.

**Books/Book Chapters (3/3):**

1. Colgren, R., "The Conceptual Design of UAVs," Book Proposal to John Wiley & Sons Ltd. (Submitted)

2. Colgren, R., "Efficient Model Reduction for the Control of Large-Scale Systems," *Efficient Modeling and Control of Large-Scale Systems*, ed. Javad Mohammadpour and Karolos M. Grigoriadis, Springer Science+Business Media, LLC., Boca Norwell, MA., 2010.
3. Colgren, R., "Systems of Air Vehicles," *System of Systems – Principles and Applications*, ed. Mo Jamshidi, CRC Press, a Taylor and Francis Company, Boca Raton, Florida, 2008.
4. Colgren, R., "Basic MATLAB, Simulink, and Stateflow," AIAA Education Series, 2007.
5. Colgren, R., "Applications of Robust Control to Nonlinear Systems," Progress in Aeronautics and Astronautics Series, AIAA, Vol. 205, 2004.
6. Colgren, R., "Workstations for the Integrated Design and Simulation of Flight Control Systems," Chapter 8 of *Simulation Systems*, ed. George Zobrist and J. V. Leonard, Gordon and Breach Science Publishers, Amsterdam, NETHERLANDS, 2000.

#### **Journal Articles (13):**

1. Sadraey, M., and Colgren, R., "Coupling Stability Derivatives and the State Space Formulation of 6 DOF Coupled Equations of Motion," *International Journal on Control*. (Submitted)
2. Keshmiri, S., Lan, C.-T., Colgren, R. and Mirmirani, M., "Trajectory Optimization of an Advanced Generic Hypersonic Vehicle," *AIAA Journal on Spacecraft and Rockets*. (Submitted)
3. Bhandari, S., Colgren, R., "12-DoF Dynamics Model of a Small UAV Helicopter Developed using Analytical and Parameter Identification Techniques," *Journal of the American Helicopter Society*. (Submitted)
4. Colgren, R., Sadraey, M., "Robust Nonlinear Autopilot Design for a Complete UAV Mission," *Asian Journal of Control*. (Submitted, Second Review Round)
5. Colgren, R., Keshmiri, S., and Mirmirani, M., "A Nonlinear Ten Degrees of Freedom Dynamics Model of a Generic Hypersonic Vehicle," *AIAA Journal of Aircraft*, Vol. 46 No. 3, May-June 2009, pp. 800-813 doi: 10.2514/1.35644
6. Colgren, R., and Loschke, R., "The Effective Design of Highly Maneuverable Tailless Aircraft," *AIAA Journal of Aircraft*, Volume 45, Number 4, July-August 2008, pp. 1441-1449. doi: 10.2514/1.32083
7. Jezek, K., Braaten, D., Gogineni, S., van der Veen, C., Allen, C., Alley, R., Allison, I., Anandkrishnan, S., Bindschadler, R., Bowen, C., Bromwich, D., Colgren, R., Dahl-Jensen, D., Downing, D., Ewing, M., Fastook, J., Hale, R., Hayden, L., Hughes, T., Joughin, I., Krabill, W., Landis, C., LeCompte, M., Leuschen, C., Mosley-Thompson, E., Pollard, D., Prescott, G., Rignot, E., Thomas, R., Thompson, L., Webber, G., Wingham, D., and Zagorodnov, V., "Center for Remote Sensing of Ice Sheets (CREGIS)," *EOS Transactions*, AGU, 88(38), 371, 2007.
8. Zhou, Z., and Colgren, R., "A Nonlinear Spacecraft Attitude Tracking Controller for Large Non-constant Rate Commands," *International Journal of Control*, Vol. 78, No. 5, March 2005, pp. 311-325.
9. Frye, M., Qian, C., and Colgren, R., "Decentralized Control of Large-Scale Uncertain Nonlinear Systems by Linear Output Feedback," *Communications in Information and Systems*, Vol. 4, Number 3, Sept. 2004, pp. 191-210.
10. Lyshevski, S., Skormin, V., and Colgren, R., "High Torque Density Integrated Electro-Mechanical Flight Actuators," *IEEE Transactions on Aerospace and Electronic Systems*, published online January 2002. Vol. 38, No. 1, pp. 174-182. doi: 10.1109/7.993238
11. Colgren, R., "The Feasibility of using an INS for Control System Feedbacks," Society of Automotive Engineers, *SAE Transactions – Journal of Aerospace*, Warrendale, PA, Aug. 1999.

12. Colgren, R., Jonckheere, E., "H $\infty$  Control of a Class of Nonlinear Systems using Describing Functions and Simplicial Algorithms," *IEEE Transactions on Automatic Control*, published online May 1997, Vol. 42, No. 5, pp. 707-712. doi: 10.1109/9.580883
13. Colgren, R., "Workstation for the Integrated Design and Simulation of Flight Control Systems," *IEEE Control Systems Magazine*, June 1989, Vol. 9, No. 4, pp. 25-28.

#### **Patents (5):**

1. Colgren, R., Holly, L., and Donovan, W., "Utility Patent, Modular Unmanned Air-Vehicle," U. S. Patent Number, 7,922,115, 12 April 2011.
2. Colgren, R., Holly, L., Donovan, W., and Thompson, L., "Design Patent, Modular Unmanned Air-Vehicle," U. S. Patent Office, Patent D596267, 14 July 2009.
3. Colgren, R., Holly, L., and Donovan, W., "Provisional Utility Patent, Modular Unmanned Air-Vehicle," U. S. Patent Office, Provisional U. S. Patent, 60/745,362, 21 April 2006.
4. Colgren, R., "Method and System for Elimination and Correction of Angle-of-Attack and Sideslip Angle from Acceleration Measurements," U. S. Patent No. 6,273,370, 14 August 2001.
5. Colgren, R., Criss, C., and Criss, R., "Rocket-Powered Ducted Fan Engine," United States Patent Office, Patent Number 5,063,735, 12 November 1991.

#### **HONORS AND AWARDS**

2008 Best Paper Award for the AIAA Modeling and Simulation Technology Conference.

Distinguished Service Award, Chair, 2008 AIAA Atmospheric Flight Mechanics Conference.

2008 Distinguished Service Award, AIAA Atmospheric Flight Mechanics Technical Committee.

Service Award, UAS Symposium, October 2007.

2005 Distinguished Service Award, AIAA Guidance, Navigation, and Control Technical Committee.

25 Year Member Award, American Institute of Aeronautics and Astronautics (AIAA).

2002 Best Paper Award for the Modeling and Simulation Technology Conference.

2001 Best Paper Award for the IEEE Aerospace Conference.

1999 Skunk Works Honor's Leadership Award Honorable Mention.

1999 Outstanding Service Award, Area Chair, Guidance, Navigation and Control Conference.

1996 Skunk Works Honor's Award Honorable Mention – U-2 Cockpit Procedures Trainer Team.

1996 USAF WR-ALC/LREA Certificate of Appreciation for significant contributions to the U-2 Cockpit Procedures Trainer (CPT) program.

1996 Lockheed Commendation for significant contributions to the U-2 Cockpit Procedures Trainer (CPT).

1996 AIAA Technical Activities Staff Commendation as Technical Program Chairman of the AIAA Guidance, Navigation, and Control Conference.

1996 IFAC World Congress Top Ten Poster Session.

1995 Lockheed Achievement Award for successful completion of the U-2 APADS development program.

1994 Lockheed Commendation for Tier II+ work for "Flight Controls Work and Coordination of all Flight Management System work at Allied Signal in Teterboro, New Jersey."

1993 USAF Commendation for successful crash investigation work.

Appointed Senior Member of the Institute of Electrical and Electronics Engineers (IEEE) and the Control Systems Society in 1993.

Appointed Associate Fellow of the American Institute of Aeronautics and Astronautics (AIAA) in 1991.

Appointed Senior Member of the American Institute of Aeronautics and Astronautics (AIAA) in 1989.

1986 CALAC ADP Classified Program Commendation for “essentially by himself, developed a flight control system that was lightweight, reliable, and incorporates unstable aerodynamics and load alleviation.”

Member, Tau Beta Pi.

Biographies in:

- Who’s Who in America.
- Who’s Who in Science and Engineering.
- Who’s Who in the World.
- Who’s Who in the West.
- Who’s Who in California.
- The International Directory of Distinguished Leadership (American Biographical Institute, Inc.).
- Strathmore’s Who’s Who.
- Lexington’s Who’s Who.
- 2,000 Notable American Men.

## **SERVICE**

### **International Service**

General Chair, American Institute of Aeronautics and Astronautics (AIAA) Atmospheric Flight Mechanics Conference (2008).

Member of the International Federation on Automatic Control (IFAC) Committee on Robust Control (2006 to Present).

Member of the AIAA Atmospheric Flight Mechanics Technical Committee (2005 to 2008).

Area Chair, AIAA Guidance, Navigation and Control Conference (Multiple Years).

Session Chair, AIAA Guidance, Navigation and Control Conference (Multiple Years).

General Chair, 7th International Symposium on Quantitative Feedback Theory and Robust Frequency Methods (2005).

International Committee Executive Board, Quantitative Feedback Theory (2004 to 2006).

Associate Editor, AIAA Educational Book Series Committee (2003 to Present).

Member of the International Federation on Automatic Control (IFAC) Committee on Robotics (2000 to Present).

Member of the International Association of Science and Technology for Development (IASTED), Liaison Technical Committee (2000 to Present).

Member of the International Association of Science and Technology for Development (IASTED), International Technical Committee on Guidance and Control (2000 to Present).

Associate Editor, AIAA Journal of Guidance, Control and Dynamics (1999 to 2010).

Member of the Society of Automotive Engineers (SAE) National Technical Committee on Guidance and Control (1999 to Present).

Program Chairman, AIAA Guidance, Navigation, and Control Conference (1996).

Reviewer for the Accreditation Board for Engineering and Technology (ABET) (1995 to Present).

AIAA Review Chairman, American Control Conferences (1992 and 1998).

Associate Editor, Workstation News (1992 to 1993).

Associate Editor, Journal for Theoretical and Computational Graphics (1990 to 1991).

Member and past Secretary for the National AIAA Technical Committee on Guidance, Navigation, and Control (1990 to 2005).

Associate Fellow, American Institute of Aeronautics and Astronautics (AIAA) (1980 to Present).

### **National Service**

NASA High-Level National Capability Roadmap Development Process, Strategic Focus Area, Advanced Aeronautical Technologies for Next-Generation Aviation Systems, “Air-breathing Hypersonic Vehicle Technologies,” (2005 to 2006).

Member, National Technical Committee on Guidance and Control, Society of Automotive Engineers (SAE) (1999 to Present).

Member of the Society of Automotive Engineers (SAE), member since (1999 to Present).

Member of the Accreditation Board for Engineering and Technology (ABET) (1995 to Present).

American Institute of Biological Sciences (AIBS) Consultant Roster.

### **Regional Service**

Aerospace Safety Program Proposal – Continuing Education, worked to develop this program through Continuing Ed. and Texas A&M (2005 and 2006).

Virtual presentation on UAVs to Kansas and Missouri K-12 schools (2004).

Member of the California State University, Los Angeles Mechanical Engineering Department Advisory and Development Council (2003 to 2007).

Member of the Mathematics, Science, Engineering, and Technology Consortium (2001 to Present).

Member of the California State University, Long Beach Electrical Engineering Department Advisory and Development Council (1999 to 2007).

### **Local and State Service**

Founding Member, High Plains University UAV Forum (2008).

Disaster Relief Execution - UAS Platforms in the Homeland Security Mission (2007 to 2008).

Herington UAS Flight Facility and UAS Protocol (2007 to 2008).

Member of Senator Pat Robert’s Advisory Committee on Science and Technology (2005 to 2010).

Member of Senator Pat Robert’s Aviation Task Force (2005 to 2010).

Arranged joint undergraduate engineering experiences between PSU and KU (2005 to 2009).

Chair, International Quantitative Feedback Theory Symposium, organizing to host at KU (2005).

Founder, Executive Committee Member and Past Chair of the Kansas UAV Consortium, (2004 to 2009).

AIAA Antelope Valley Section Treasurer (1991 to 1995).

AIAA Antelope Valley Section Chair (1989 to 1990 and 1990 to 1991).

### **School Service**

Organize and Conduct Aerospace Engineering Exhibit, Lawrence Airport (2008).

Judge for the High School blimp competition (2007).

Transportation Research Institute Flight Research, working on UAV developments and government funding (2006 to 2009).

Multi-Disciplinary Undergraduate Research, “Develop a Fuel-Cell Powered Electric Vehicle” (2005).  
Organize and Conduct School of Engineering Exhibit, *KU at the Capital* (2005 and 2006).  
Member, Scheduling Committee, representing the Department of Aerospace Engineering (2004 to 2008).  
Member, Academic Standards Committee, representing the Department of Aerospace Engineering (2003 to 2004).

### **Department/Unit Service**

Arranged for Visiting Researcher in Pilot Induced Oscillations (2008).  
Hosted a graduate student from the University of Piza (2007).  
Department Scheduling Officer (2004 to 2008).  
Virtual Classrooms, working to develop virtual classrooms and department policies (2003 to 2004).  
Department Curriculum Officer (2003 to 2004).

### **ADDITIONAL CLASSES AND COURSEWORK:**

**University of Phoenix (2000):** Facilitation Workshop Series  
**University of Maryland/NASA/Army (1998):** CONDUIT-Controls Designer Interface, Parameter Identification and Flight Control Law Optimization  
**Antelope Valley College (1996 to 2003):** Flex Development Activities  
**Flight Safety International (1998):** Crew Resource Management  
**American Automatic Control Council (1996):** Robust Control Design Methods, Dynamic Modeling  
**ObjecTime/Raytheon (1994):** Object Oriented Programming, Ada  
**Lockheed Martin Technical Institute (1986, 1996):** Aircraft Conceptual Design, Cockpit Egress/Ground Testing, Corporate Management  
**University of California at Los Angeles (1983):** Digital Control Systems  
**Northrop Corporation (1983):** Jovial, JCL, CAD/CAM design, Optimal Controls, and Aeroelasticity