

# Dr. Andrea L'Afflitto

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## **Contact Information**

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Last updated: March, 2018

## **Work Experience Assistant Professor.**

*Department of Aerospace and Mechanical Engineering, The University of Oklahoma, Norman, OK. August, 2015 – Present*

Research in robust output-feedback control, optimal control, and differential games theory for aerospace engineering applications. *Application*: design of autopilots for UAS.

*Courses taught:*

- Flight Controls (F. 2015–2017, G/U)
- Nonlinear Dynamical Systems and Control (Sp. 2016, 2017, G/U)
- Advanced Dynamics & Control of Mechanical Systems (F. 2017, G/U)
- Optimization & Optimal Control (Sp. 2018, G/U)

*Service:*

- Graduate studies committee member (F. 2017 – Present).

## **Summer Faculty Fellow.**

*Army Research Lab, Aberdeen, MD. May, 2017 – August, 2017*

Collaboration on the design, implementation, and testing of nonlinear robust controls for quadrotor aircraft.

## **International Space Station – Systems and Operations Engineer.**

*German Aerospace Agency (DLR), Cologne, Germany. January, 2007 – May, 2008*

Payload and operations coordinator of EXPOSE-E: a payload installed outside the European module Columbus for the International Space Station.

## **Education**

### **Ph.D. in Aerospace Engineering.**

*Georgia Institute of Technology, Atlanta, GA, USA. August 2011 – April 2015*

Research in *optimal control, finite-time state-feedback optimal control, partial-state state-feedback optimal control, and semistabilization of nonlinear dynamical systems.*

### **Master of Science in Mathematics.**

*Virginia Polytechnic Institute and State University, Blacksburg, VA, USA. August 2009 – May 2010.*

Research in calculus of variations and optimal control theory with applications to spacecraft and aircraft fuel-optimal path planning.

### **Master of Science in Aerospace Engineering and Astronautics.**

*Federico II University, Naples, Italy. September 2004 – September 2006.*

Research in space systems design in conjunction with an internship at the Italian Space Agency (ASI). *Summa cum laude.*

### **Bachelor of Science in Aerospace Engineering.**

*Federico II University, Naples, Italy. September 2001 – September 2004.*

Research in space systems design in conjunction with an internship at Co.Ri.S.T.A. (Alenia Spazio Group). *Summa cum laude.*

## Publications

### Books:

- B1. A. L’Afflitto. *A Mathematical Perspective on Flight Dynamics and Control*, Springer, London, UK – ISBN 978-3-319-47466-3.

### Book Chapters:

- BC1. K. Mohammadi and A. L’Afflitto. *Robust Adaptive Output Tracking for Quadrotor Helicopters*, in “Adaptive Robust Control and its Applications” , Dr. Le Anh Tuan ed., InTech, pp. 77-100, ISBN: 978-953-51-5729-8.
- BC2. A. L’Afflitto, W. M. Haddad. *A Variational Approach to the Fuel Optimal Control Problem for UAV Formations*, in “Recent Advances in Aircraft Technology” , Dr. Ramesh Agarwal ed., InTech, pp. 221-248, ISBN: 979-953-307-635-4.

### Selected Journal Papers [Out of 13]:

- J1. A. L’Afflitto, R. B. Anderson, and K. Mohammadi, *An Introduction to Nonlinear Robust Control for Unmanned Quadrotor Aircraft*. IEEE Control Systems Magazine – In Press.
- J2. A. L’Afflitto and K. Mohammadi, *Robust Observer-Based Control of Nonlinear Dynamical Systems with State Constraints*. Journal of the Franklin Institute, Vol. 354, 16, Nov. 2017, pp. 7385-7409.
- J3. A. L’Afflitto, *Differential Games, Partial-State Stabilization, and Model Reference Adaptive Control*. Journal of the Franklin Institute, Vol. 354, 1, Jan. 2017, pp. 456-478.
- J4. A. L’Afflitto, W. M. Haddad, and E. Bakolas, *Partial-State Stabilization and Optimal Control*. International Journal of Robust and Nonlinear Control, Vol. 26, 5, Mar. 2016, pp. 1026-1050.
- J5. W. M. Haddad and A. L’Afflitto, *Finite-Time Partial Stability, Stabilization, and Optimal Feedback Control*. Journal of the Franklin Institute, Vol. 352, 6, Mar. 2015, pp. 2329-2357.
- J6. A. L’Afflitto, W. M. Haddad, and Q. Hui, *Optimal Control for Linear and Nonlinear Semistabilization*. Journal of the Franklin Institute, Vol. 352, 3, Mar. 2015, pp. 851-881.

### Selected Conference Papers [Out of 16]:

- C1. A. L’Afflitto, *Robust Adaptive Control for Constrained Dynamical Systems Following Unreliable Reference Signals*, in proc. American Control Conference, July 2018.
- C2. A. L’Afflitto, *Differential Games, Asymptotic Stabilization, and Robust Optimal Control of Nonlinear Systems*, in proc. Conference on Decision and Control, December 2016.
- C3. A. L’Afflitto and W. M. Haddad, *Singular Linear-Quadratic Control for Semistabilization*. Conference on Decision and Control, Florence, Italy, December 2013.
- C4. A. L’Afflitto and C. Sultan, *On The Optimal Fuel and Energy Consumption for Spacecraft Path Planning in Low Earth Orbit*. IFAC Conference 2011, Milan, Italy, August 2010.
- C5. A. L’Afflitto and C. Sultan, *On the Fuel and Energy Consumption Optimization Problem in Aircraft Path Planning*. IEEE Conference on Decision and Control, Atlanta, GA, December 2010.
- C6. A. L’Afflitto and C. Sultan, *Calculus of Variations for Guaranteed Optimal Path Planning of Aircraft Formations*. IEEE International Conference on Robotics and Automation, Anchorage, AK, May 2010.

### Selected Invited Talks:

- I1. From theory to practice: A nonlinear robust control to assist quadrotor pilots in adverse conditions. Naval Future Force Science and Technology Expo, July 20, 2017.
- I2. Robust Control, Optimal Control, and Differential Games. University of New Mexico, October 28, 2016.

- I3. Optimal Control and Differential Games: From Spacecraft Attitude Control to Formation Flying. Kirtland Air Force Base, August 11, 2016.
- I4. Robust Control, Optimal Control, and Differential Games. Wright-Patterson Air Force Base, July 22, 2016.
- I5. Optimal Control and Differential Games: From Spacecraft Attitude Control to Formation Flying. Italian Center for Aerospace Research (CIRA) – May 19, 2016.

***Selected Awards***

**Funding:**

- **A. L’Afflitto** *DARPA-RA-17-01-YFA-FP-090, TA24 – A bio-inspired approach to fly undetected in cluttered environments*, DARPA Young Faculty Award, July 2018 – June 2021. Cumulative: Under negotiation.
- **A. L’Afflitto** *T3C1S4C – UAS Control System – Robotics CTA 2017-18 Biennial Program Plan*, Army Research Lab through Robotics Collaborative Technology Alliance, January 2018 – December 2020. Cumulative: **\$185,343**.
- **A. L’Afflitto** and Z. Siddique *Collaborative Research: Unmanned Aerial Systems and Specialized Workforce Development to Support Oklahoman Agriculture and Industry*, NSF ATE Program, July 2017 – July 2020. Cumulative: **\$408,804**; Personal share: **\$224,842**.

**Editorial Activities:**

- IET Control Theory and Applications – Top 5% most outstanding reviewer out of over 1000 – 2016.

***Editorial Activities***

**Journals:**

- Elsevier – Control Engineering Practice, Associate editor, 2015 – Present.
- Springer – Journal of Intelligent & Robotic Systems, Guest editor, 2017.

**Conferences:**

- Networked and Autonomous Air and Space Systems Conference 2018, Editorial board member.
- American Control Conference 2017, Associate editor.

***Reviewer***

**Books:**

- Springer.

**Selected Journals:**

- *Elsevier Automatica*.
- *Elsevier Systems & Control Letters*.
- *IEEE Transactions on Automatic Control*.
- *IEEE Control Systems Magazine*.
- *Taylor & Francis International Journal of Control*.
- *Wiley International Journal of Robust and Nonlinear Control*.

**Selected Conferences:**

- *IEEE American Control Conference*, 2010, 2011, 2013, 2016, 2018.
- *IEEE Conference on Decision and Control*, 2012–2015.
- *IFAC International Conference on Automatic Control*, 2011, 2014.

***Professional Associations***

- *IEEE Technical Committee on Aerospace Control* – Member
- *AIAA Technical Committee on Guidance Navigation, and Control* – Member
- *AIAA Young Professionals Committee* – Former Region 1 Deputy Director