



## Nathan Slegers

Associate Professor

Department of Mechanical and  
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### BIO:

Dr. Nathan Slegers is currently an Associate Professor of Mechanical and Aerospace Engineering at the University of Alabama in Huntsville. His research focuses on the intersection of dynamic modeling, control engineering, and robotics to optimize performance. More specifically, accurate dynamic models can be used in predictive control strategies to achieve a variety of objectives while also leading to a better understanding of the system. To date, he has overseen externally funded research in precision placement of autonomous parafoils, predictive guidance of smart weapons, predictive guidance of small unmanned aerially vehicles, and developed a miniature autopilot for autonomous rotorcraft. His research has resulted in experimentally proven predictive control algorithms for many different dynamic systems. Dr. Slegers continues to improve actively controlled aerospace devices by combining modeling, innovative sensor systems, and unique control methods. Accurate physics based models of complex multi-body systems are used for theoretical analysis, system optimization, and simulation.

As an educator, Dr. Slegers has developed new curricula in mechatronics to prepare students for synergistic integration of mechanical and aerospace engineering with electronics and control theory. The mechatronics courses use a balance of theoretical analysis and hardware implementation in system design. Principles of mechatronics are demonstrated by investigating the complete design process through projects. These projects have included rotorcraft heading lock, optical sensors, and unmanned ground and aerial vehicles.

Dr. Slegers is a Senior Member of the AIAA. He also serves as member of the Aerodynamics Decelerator System (ADS) technical committee and is chair of the ADS student paper competition.

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### RELEVANT PUBLICATIONS:

1. C. Gorman, N. Slegers, "Evaluation of Multi-body Dynamics Using Distributed Miniature Wireless Sensors," *Journal of Aircraft*, Vol. 49, No 2, 2012.
2. N. Slegers, R. Kadish, G. Payton, J. Thomas, M. Griffin, D. Dumbacher, "Learning from Failure in Systems Engineering: A Panel Discussion," *Systems Engineering*, Vol 15, No 1, pp. 74-82, 2012.
3. N. Slegers, O. Yakimenko, "Terminal Guidance of Autonomous Parafoils in High Wind to Airspeed Ratios," *J. Aerospace Engineering IMechE, Part G*, Vol 225, No 3, pp 336-346, 2011.
4. B Hembree, N. Slegers, "Efficient tether dynamic model formulation using rigid-body dynamics," *J. Multi-body Dynamics IMechE, Part K*, Vol 224, No 4, pp 353-363, 2010.
5. N. Slegers, "Effects of Canopy-Payload Relative Motion on Control of Autonomous Parafoils," *Journal of Guidance, Control, and Dynamics*, Vol 33, No 1, pp 116-125, 2010.
6. C. Gorman and N. Slegers, "Model Predictive Control of Continuous Nonlinear Systems Using Series Approximations," *International Review of Automatic Control*, Vol 2, No 2, 2009.
7. P. Hahn, R. Frederick, N. Slegers, "Predictive Guidance of a Projectile for Hit-to-Kill Interception," *IEEE Transaction on Control System Technology*, Vol 17, No 4, 2009.
8. J. Harris and N. Slegers, "Performance of a Fire-and-Forget Anti-Tank Missile with a Damaged Wing," *Mathematical and Computer Modeling*, Vol 50, pp. 292-305, 2009.
9. N. Slegers, "Predictive Control of a Munition Using Low Speed Linear Theory," *Journal of Guidance, Control, and Dynamics*, Vol 31, No 3, pp 768-774, 2008.
10. N. Slegers, E. Beyer, M. Costello, "Use of Variable Incidence Angle for Glide Slope Control of Autonomous Parafoils," *Journal of Guidance, Control, and Dynamics*, Vol 31, No 3, pp 585-596, 2008.
11. N. Slegers, M. Costello, "Variable Structure Observer for Control Bias on Unmanned Air Vehicles," *Journal of Guidance, Control, and Dynamics*, Vol 30, No 1, pp 281-286, 2007.
12. N. Slegers, J. Kyle, M. Costello, "A Nonlinear Model Predictive Control Technique for Unmanned for Air Vehicles," *Journal of Guidance, Control, and Dynamics*, Vol 29, No 5, pp 1179-1188, 2006.
13. N. Slegers, M. Costello, "Model Predictive Control of a Parafoil and Payload System," *Journal of Guidance, Control, and Dynamics*, Vol 28, No 4, pp 816-821, 2005.
14. N. Slegers, M. Costello, "Aspects of Control for a Parafoil and Payload System," *Journal of Guidance, Control, and Dynamics*, Vol 26, No 6, pp 898-905, 2003.