

# Craig A. Woolsey

<http://www.aoe.vt.edu/~cwoolsey>

## Contact Information:

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Aerospace & Ocean Engineering Department  
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## Research Interests:

Dr. Woolsey's research interests include nonlinear control theory for mechanical systems, particularly energy-based control methods, and control of autonomous systems including autonomous marine and air vehicles. Since the Fall of 2006, Dr. Woolsey has served as the inaugural director of the Virginia Center for Autonomous Systems ([www.unmanned.vt.edu](http://www.unmanned.vt.edu)), a Virginia Tech ICTAS/College of Engineering Research Center.

## Education:

Ph.D. in Mechanical & Aerospace Engineering, Princeton University, January 2001.

M.A. in Mechanical & Aerospace Engineering, Princeton University, June 1997.

B.M.E., Georgia Institute of Technology, March 1995. (Highest Honor, Cooperative Employment Plan)

## Professional Experience:

Sep. 2008 – present      Associate Professor & Assistant Department Head for Graduate Studies  
Aerospace & Ocean Engineering Department  
Virginia Tech, Blacksburg, VA

Sep. 2006 – 2008      Associate Professor  
Aerospace & Ocean Engineering Department  
Virginia Tech, Blacksburg, VA

Jan. 2001 – Aug. 2006      Assistant Professor  
Aerospace & Ocean Engineering Department  
Virginia Tech, Blacksburg, VA

July 1995 – Dec. 2000      Graduate Research Assistant and Assistant in Instruction  
Mechanical & Aerospace Engineering Department  
Princeton University, Princeton, NJ

June 1991 - Sept. 1994      Student Employee, Cooperative Plan,  
Office of Scientific and Weapons Research (Directorate of Intelligence)  
& Office of Logistics (Directorate of Administration),  
Central Intelligence Agency, Washington, D.C.  
(*Clearance Level: Top Secret, Sensitive Compartmented Information*)

## Professional Affiliations:

American Institute of Aeronautics and Astronautics (AIAA), Associate Fellow

Institute of Electrical and Electronics Engineers (IEEE), Senior Member

International Federation of Automatic Control (IFAC), Member

The American Society for Engineering Education (ASEE), Member

Association for Unmanned Vehicle Systems International (AUVSI), Member

## **Professional & University Service:**

Director, Virginia Center for Autonomous Systems (2006 – present)  
AOE Assistant Department Head for Graduate Studies (2008 – present)  
AOE Graduate Committee (Member, 2006 – present; Chair, 2007 – present)  
College of Engineering Graduate Curriculum Committee (Member, 2006 – present; Chair, 2009 – 2011)  
AOE Dynamics & Control Group Interim Leader (2006 – present)  
Faculty Co-Advisor, Autonomous Underwater Vehicle Team (2002 – present)  
Faculty Co-Advisor, Virginia Tech Student Chapter of AIAA (2003 – 2008)  
Virginia Tech ADVANCE Advisory Board (2003 – 2008)  
Chair, AOE Student Opportunities Committee (2003 – 2007)  
Cooper House Presbyterian Campus Ministry (Board, 2001 – 2007; Endowment Committee, 2007 -- present)  
Associate Editor, *American Control Conference* (2006, 2007, 2009)

### **Organizing/Program Committees:**

- 18<sup>th</sup> *International Symposium on Mathematical Theory of Networks & Systems* (Blacksburg, VA, 2008);
- 2008 *American Control Conference* (Seattle, WA, 2008);
- 2013 *American Control Conference* (Washington, D.C., 2013);
- 1<sup>st</sup> *IFAC Workshop on Guidance & Control of Underwater Vehicles* (Newport, South Wales, U.K., 2003)

Frequent or occasional reviewer for the following journals: *AIAA Journal of Guidance, Control, and Dynamics*; *ASME Journal of Dynamic Systems, Measurement, and Control*; *Automatica*; *Control Systems Magazine*; *Discrete and Continuous Dynamical Systems, Series B*; *Dynamical Systems*; *European Journal of Control*; *IEEE Journal of Oceanic Engineering*; *IEEE Transactions on Automatic Control*; *IEEE Transactions on Control Systems Technology*; *IEEE Transactions on Robotics and Automation*; *Intelligent Service Robotics*; *International Journal of Control*; *Journal of Atmospheric and Oceanic Technology*; *Journal of Geometric Mechanics*; *Journal of Vibration and Control*; *Nonlinear Dynamics*; *Ocean Engineering*; *SIAM Journal on Control and Optimization*; *Systems and Control Letters*; *Simulation*

Frequent or occasional reviewer for the following conferences: *AIAA Guidance, Navigation, and Control Conference*; *American Control Conference*; *American Towing Tank Conference*; *IEEE Conference on Decision and Control*; *International Conference on Intelligent Robots and Systems*; *IEEE/MTS OCEANS*; *Multi-Conference on Systems and Control*.

## **Honors & Awards:**

SAE Ralph R. Teetor Educational Award (2008)  
NSF Faculty Early Career Development (CAREER) Award (2002—2007)  
ONR Young Investigator Program Award (2002—2005)  
NASA Institute for Advance Concepts Fellow (2004-2005)  
Virginia Tech College of Engineering Faculty Fellow (2003 – 2006)  
Virginia Tech College of Engineering Dean's Award: Outstanding New Assistant Professor (2003)  
NDSE (Department of Defense) Graduate Fellowship (1995–1998)  
NSF Graduate Fellowship (deferred) (1995)  
Guggenheim Fellowship (Princeton University) (1995)  
Georgia Tech President's Scholar (1990 – 1995)  
Tau Beta Pi Senior Engineering Cup (Georgia Tech) (1995)  
College of Engineering Award (Georgia Tech) (1994)  
CIA Exceptional Performance Award (1993)

## Publications:

### Notes:

- \* denotes an undergraduate, graduate, or postdoctoral research assistant advised or co-advised by C. Woolsey.
- Original or extended versions of all publications are available upon request.

### Journal publications:

- [1] "UAV coordination on smooth convex loops in wind" L. Techy\*, D. Paley, and C. A. Woolsey. *AIAA Journal of Guidance, Control, and Dynamics*, **33**(6), pp. 1946-1951, November-December 2010.
- [2] "Backstepping for synchronization of nonlinear dynamical systems," K. Listmann, J. Adamy, and C. A. Woolsey. *Automatisierungstechnik*, pp. 425-434, August 2010.
- [3] "Coordinated aerobiological sampling of a plant pathogen in the lower atmosphere using two autonomous unmanned aerial vehicles," L. Techy\*, D. Schmale, III, and C. A. Woolsey. *Journal of Field Robotics* **27**(3), pp. 335-343, May/June 2010.
- [4] "Fast estimation for range identification in the presence of unknown motion parameters," L. Ma\*, C. Cao, N. Hovakimyan, C. Woolsey, and W. Dixon. *IMA Journal of Applied Mathematics*, **75**(2), pp. 165-189, February 2010.
- [5] "Approximate analytical turning conditions for underwater gliders and implications for path planning," N. Mahmoudian\*, J. Geisbert\*, and C. Woolsey. *IEEE Journal of Oceanic Engineering* **35**(1), pp. 131-143, January 2010.
- [6] "Minimum-time path planning for unmanned aerial vehicles in steady uniform winds," L. Techy\* and C. A. Woolsey. *AIAA Journal of Guidance, Control, and Dynamics*, **32**(6), pp. 1736-1746, November-December 2009.
- [7] "Cross-track control of a slender, underactuated AUV using potential shaping," C. A. Woolsey and L. Techy\*. *Ocean Engineering: Special Issue on AUVs* **36**(1), pp. 82-91, January 2009.
- [8] "Planar flow model identification for improved navigation of small AUVs," J. Petrich, C. A. Woolsey, and D. J. Stilwell. *Ocean Engineering: Special Issue on AUVs*. **36**(1), pp. 119-131, January 2009.
- [9] "Global directional control of a slender AUV," H.-Y. Kim\* and C. A. Woolsey. *AIAA Journal of Guidance, Control, and Dynamics* **30**(1), pp. 255-259, January-February 2007.
- [10] "Exploring Titan with autonomous, buoyancy-driven gliders," M. Morrow\*, C. A. Woolsey, and G. Hagerman. *Journal of the British Interplanetary Society* **59**(1), pp. 27-34, January 2006.
- [11] "Backstepping control of an SMA-actuated robotic arm," M. H. Elahinia, J. Koo, M. Ahmadian, and C. A. Woolsey. *Journal of Vibration and Control* **11**(3), pp. 407-429, March 2005.
- [12] "Reduced Hamiltonian dynamics for a rigid body/mass particle system," C. Woolsey. *AIAA Journal of Guidance, Control, and Dynamics* **28**(1), pp. 131-138, January-February 2005.
- [13] "Controlled Lagrangian systems with gyroscopic forcing and dissipation," C. Woolsey, C. K. Reddy\*, A. M. Bloch, D. E. Chang, N. E. Leonard, J. E. Marsden. *European Journal of Control (Special Issue on Lagrangian and Hamiltonian Methods for Nonlinear Control)* **10**(5), pp. 478-496, December 2004.
- [14] "Stabilizing underwater vehicle motion using internal rotors," C. Woolsey and N. E. Leonard. *Automatica*, **38**(12), pp. 2053-2062, December 2002.
- [15] "The equivalence of controlled Lagrangian and controlled Hamiltonian systems," D. E. Chang, A. M. Bloch, N. E. Leonard, J. E. Marsden, and C. Woolsey *Control, Optimisation, and Calculus of Variations (Special Issue Dedicated to J. L. Lions)* **8**, pp. 393-422, June 2002.
- [16] "Transfer functions for acoustic emission transducers using laser interferometry," L. J. Jacobs and C. Woolsey, *Journal of the Acoustical Society of America*, **94** (6), pp. 3506-3508, December 1993.

### Conference publications (accepted based on review of the full paper):

- [1] "Long-baseline acoustic localization of the *Seaglider* underwater glider," L. Techy, K. Morgansen, and C. A. Woolsey, *Proc. American Control Conference*, San Francisco, CA, July 2011.
- [2] "Pose estimation from visual measurements using epipolar geometry," M. J. Monda\* and C. A. Woolsey, *Proc. 49<sup>th</sup> IEEE Conference on Decision and Control*, pp. 1633-1638, Atlanta, GA, December 2010.

- [3] “Planar path planning for flight vehicles in wind with turn rate and acceleration bounds,” L. Techy\*, C. A. Woolsey, and K. Morgansen, *International Conference on Robotics & Automation*. Anchorage, AK, May 2010.
- [4] “UAV coordination on convex curves in wind: An environmental sampling application,” L. Techy\*, D. A. Paley, and C. A. Woolsey, *2009 European Control Conference*, pp. 4967-4972, Budapest, Hungary, August 2009.
- [5] “Passivity-based coordination of multi-agent systems: A backstepping approach,” K. D. Listmann, C. A. Woolsey and J. Adamy, *2009 European Control Conference*. , pp. 2450-2455, Budapest, Hungary, August 2009.
- [6] “The educational impact of creating a new UAV for curriculum enhancement,” J. F. Murtha\*, M. C. Cotting\*, A. Wolek\*, T. Aarons\*, and C. A. Woolsey, *2009 AIAA Atmospheric Flight Mechanics Conference*, Chicago, IL, August 2009. (AIAA-2009-5851)
- [7] “Examples of augmentation of an atmospheric flight mechanics curriculum using UAVs,” M. C. Cotting\*, J. F. Murtha\*, L. Techy\*, and C. A. Woolsey, *2009 AIAA Atmospheric Flight Mechanics Conference*, Chicago, IL, August 2009. (AIAA 2009 5852)
- [8] “Coordinated perimeter patrol with minimum-time alert response,” D. Paley, L. Techy\* and C. A. Woolsey, *AIAA Guidance, Navigation, and Control Conference*, Chicago, IL, August 2009. (Invited paper; AIAA-2009-6210)
- [9] “Analysis of feedforward-feedback control design for underwater gliders based on slowly varying systems theory,” N. Mahmoudian\* and C. A. Woolsey, *AIAA Guidance, Navigation, and Control Conference*, Chicago, IL, August 2009. (AIAA-2009-5755)
- [10] “Estimation of an affine motion”, L. Ma, C. Cao, N. Hovakimyan, C. Woolsey, and G. Hu, *2009 American Control Conference*, pp. 5085 – 5090, St. Louis, MO, June 2009.
- [11] “Underwater glider motion control,” N. Mahmoudian\* and C. A. Woolsey, *Proc. 47<sup>th</sup> IEEE Conference on Decision and Control*, pp. 552 – 557, Cancun, Mexico, December 2008.
- [12] “Path planning for efficient UAV coordination in aerobiological sampling missions,” L. Techy\*, C. A. Woolsey, D. G. Schmale III, *Proc. 47<sup>th</sup> IEEE Conference on Decision and Control*, pp. 2814 - 2819, Cancun, Mexico, December 2008.
- [13] “Optimal control for an underwater glider: Avoiding stall in a symmetric pull-up,” R. J. Kraus\*, E. M. Cliff, J. C. Luby, and C. A. Woolsey. *Proc. 18<sup>th</sup> International Symposium on Mathematical Theory of Networks and Systems*, Blacksburg, VA, August 2008 (Invited paper.)
- [14] “Trajectory tracking for high aspect-ratio flying wings,” B. Raghavan, M. J. Patil, and C. A. Woolsey, *2008 AIAA Atmospheric Flight Mechanics Conference*, Honolulu, HI, August 2008 (AIAA-2008-6372)
- [15] “Steady turns and optimal paths for underwater gliders,” N. Mahmoudian\*, J. Geisbert\*, and C. A. Woolsey, *AIAA Guidance, Navigation, and Control Conference*, Hilton Head Island, SC, August 2007 (AIAA-2007-6602)
- [16] “Ground target localization and tracking in a riverine environment from a UAV with a gimbaled camera,” M. J. Monda\*, C. A. Woolsey , and C. K. Reddy\*, *AIAA Guidance, Navigation, and Control Conference*, Hilton Head Island, SC, August 2007 (AIAA-2007-6747)
- [17] “Rapid motion estimation of a target moving with time-varying velocity,” V. N. Dobrokhodov, I. I. Kaminer, K. D. Jones, I. Kitsios, C. Cao, L. Ma\*, N. Hovakimyan, and C. A. Woolsey, *AIAA Guidance, Navigation, and Control Conference*, Hilton Head Island, SC, August 2007 (AIAA-2007-6746)
- [18] “Development of a vision-based guidance law for tracking a moving target,” L. Ma\*, C. Cao, N. Hovakimyan, C. A. Woolsey, V. N. Dobrokhodov, and I. I. Kaminer, *AIAA Guidance, Navigation, and Control Conference*, Hilton Head Island, SC, August 2007 (AIAA-2007-6744)
- [19] “L<sub>1</sub> adaptive control of a UAV for aerobiological sampling,” J. Wang, V. Patel, C. A. Woolsey, N. Hovakimyan, and D. Schmale, III *2007 American Control Conference*, pp. 4660-4665, New York, NY.
- [20] “Nonlinear control of a novel two-link pendulum,” L. Techy\*, C. K. Reddy\*, C. A. Woolsey, C. Cao, and N. Hovakimyan *2007 American Control Conference*, pp. 19-24, New York, NY.
- [21] “Range identification in the presence of unknown motion parameters for perspective vision systems,” L. Ma\*, C. Cao, N. Hovakimyan, W. E. Dixon, and C. A. Woolsey *2007 American Control Conference*, pp. 972-977, New York, NY.
- [22] “Directional control of a slender, underactuated AUV using potential shaping,” C. A. Woolsey *Proc. 45<sup>th</sup> IEEE Conference on Decision and Control*, pp. 6826-6831, San Diego, CA, December 2006 (Invited paper.)

- [23] "Flight test bed for visual tracking of small UAVs," L. Ma\*, V. Stepanyan, C. Cao, I. Faruque\*, C. A. Woolsey, and N. Hovakimyan. *Proc. 2006 AIAA Guidance, Navigation, and Control Conference*, Aug. 21-24, Keystone, CO. (AIAA-2006-6609)
- [24] "Energy shaping for vehicles with point mass actuators," C. K. Reddy\* and C. A. Woolsey. *Proc. 2006 American Control Conference*, pp. 4291-4296, Minneapolis, MN.
- [25] "Directional control of a streamlined underwater vehicle by feedback passivation," H.-Y. Kim\* and C. Woolsey. *Proc. 2004 American Control Conference*, pp. 2998-3003, Boston, MA.
- [26] "Controlled Lagrangians with gyroscopic forcing: An experimental application," K. Reddy\*, W. Whitacre\*, and C. Woolsey. *Proc. 2004 American Control Conference*, pp. 511-516, Boston, MA.
- [27] "Passive and active attitude stabilization for a tow-fish," C. Woolsey and A. Gargett. *Proc. 41<sup>st</sup> IEEE Conference on Decision and Control*, pp. 2099-2104, Las Vegas, NV, December 2002. (Invited paper.)
- [28] "Hamiltonian attitude dynamics for a spacecraft with a point mass oscillator," C. Woolsey. *Proc. 15<sup>th</sup> International Symposium on Mathematical Theory of Networks and Systems*, Notre Dame, IN, August 2002. (Invited paper.)
- [29] "Moving mass control for underwater vehicles," C. Woolsey and N. E. Leonard. *Proc. 2002 American Control Conference*, pp. 2824-2829, Anchorage, AK, May 2002. (Invited paper.)
- [30] "Dissipation and controlled Euler-Poincaré systems," C. Woolsey, A. Bloch, N. E. Leonard, and J. Marsden. *Proc. 40<sup>th</sup> IEEE Conference on Decision and Control*, pp. 3378-3383, Orlando, FL, December 2001.
- [31] "Physical dissipation and the method of controlled Lagrangians," C. Woolsey, A. Bloch, N. E. Leonard, and J. Marsden. *Proc. 2001 European Control Conference*, pp. 2570-2575, Porto, Portugal, September 2001.
- [32] "Modification of Hamiltonian structure to stabilize an underwater vehicle," C. Woolsey and N. E. Leonard, *Proc. IFAC Workshop on Lagrangian and Hamiltonian Methods for Nonlinear Control*, pp. 185-186, Princeton, NJ, March 2000.
- [33] "Asymptotic stabilization of Euler-Poincaré mechanical systems," A. Bloch, D. Chang, N. E. Leonard, J. Marsden and C. Woolsey, *Proc. IFAC Workshop on Lagrangian and Hamiltonian Methods for Nonlinear Control*, pp. 56-61 Princeton, NJ, March 2000. (Invited paper.)
- [34] "Global asymptotic stabilization of an underwater vehicle using internal rotors," C. Woolsey and N. E. Leonard, *Proc. 38<sup>th</sup> IEEE Conference on Decision and Control*, pp. 2527-2532, Phoenix, AZ, December 1999.
- [35] "Underwater vehicle stabilization using internal rotors," C. Woolsey and N. E. Leonard, *Proc. 1999 American Control Conference*, pp. 3417-3421, San Diego, CA, June 1999.
- [36] "Internal actuation for intelligent underwater vehicle control," N. E. Leonard and C. Woolsey, *Proc. 10<sup>th</sup> Yale Workshop on Adaptive and Learning Systems*, pp. 295-300, New Haven, CT, June 1998. (Invited paper.)
- [37] "Design and analysis of an underwater vehicle for controlled gliding," J. Graver, J. Liu, C. Woolsey, and N. E. Leonard, *Proc. 1998 Conference on Information Sciences and Systems*, pp. 801-806, Princeton, NJ, March 1998.

Conference publications (accepted based on an abstract):

- [1] "Design for flight test of a scaled joined wing SensorCraft," J. Richards, T. Aarons\*, A. Suleman, R. A. Canfield, C. Woolsey, N. Lindsley, and M. Blair, *Structures, Structural Dynamics, and Materials Conference*, Denver, CO, April 2011.
- [2] "Control-oriented planar motion modeling of unmanned surface vehicles," C. Sonnenburg\*, A. Gadre, D. Horner, S. Kragelund, D. J. Stilwell, and C. A. Woolsey, *MTS/IEEE OCEANS 2010*, Seattle, WA
- [3] "Developmental flight testing of the SPAARO UAV," M. C. Cotting, A. Wolek, J. F. Murtha, and C. A. Woolsey, *48th AIAA Aerospace Sciences Meeting and Exposition*, Orlando, FL, January 2010.
- [4] "Monitoring the spread of a plant pathogen in the lower atmosphere using unmanned aerial vehicles and a buoyancy-controlled weather balloon," L. Techy, D. Schmale, & C. Woolsey, *SAE AeroTech Congress & Exhibition*, Seattle, WA, October 2009.
- [5] "Optimal underwater glider trajectories in depth-varying currents," R. J. Kraus, C. A. Woolsey, and E. M. Cliff. *Proc. 2009 Int. Symp. on Unmanned Untethered Submersible Technology*, Durham, NH, August 2009.
- [6] "Underwater glider path planning for efficient oceanographic sampling," N. Mahmoudian and C. A. Woolsey. *Proc. 2009 Int. Symp. on Unmanned Untethered Submersible Technology*, Durham, NH, August 2009.
- [7] "Subsurface and surface sensing for autonomous navigation in a riverine environment," A. Gadre, S. Kragelund, T. Masek, D. Stilwell, C. A. Woolsey, and D. Horner. *Proc. AUVSI Unmanned Systems North America*, August 10-13. 2009, Washington, DC

- [8] "Identification of a low-complexity flow field model for AUV applications," J. Petrich\*, C. A. Woolsey, and D. J. Stilwell. *Proc. MTS/IEEE OCEANS 2005*, September 19-23, 2005, Washington, DC
- [9] "A low-speed control module for a streamlined AUV," C. Nickell\*, C. A. Woolsey, and D. J. Stilwell. *Proc. MTS/IEEE OCEANS 2005*, September 19-23, 2005, Washington, DC
- [10] "Control design and stability analysis for a two-stage towing system," E. Schuch\*, A. Linklater\*, N. Lambeth\*, and C. A. Woolsey. *Proc. MTS/IEEE OCEANS 2005*, September 19-23, 2005, Washington, DC
- [11] "Adaptive output feedback control of a spheroidal underactuated underwater vehicle," V. Stepanyan, N. Hovakimyan, and C. A. Woolsey. *Proc. MTS/IEEE OCEANS 2005*, September 19-23, 2005, Washington, DC
- [12] "Model-based nonlinear control of an SMA-actuated robotic arm," M. H. Elahinia, J. Koo, C. Woolsey and M. Ahmadian. *ASME International Mechanical Engineering Congress*, November 13-19, 2004, Anaheim, CA.
- [13] "Model-based nonlinear control of an SMA-actuated robotic arm: An experimental study," J. Koo, M. H. Elahinia, M. Ahmadian, and C. Woolsey. *Tenth Conference on Nonlinear Vibrations, Stability, and Dynamics of Structures*, July 25-29, 2004, Blacksburg, VA.
- [14] "An experimental platform for validating internal actuator control strategies," C. Schultz\* and C. Woolsey. *Proc. 1<sup>st</sup> IFAC Workshop on Guidance & Control of Underwater Vehicles*, pp. 209-214, Newport, South Wales, U.K 2003.
- [15] "Assessing conceptual knowledge in an engineering course: Four case studies," M. Allen, W. Devenport, J. Wang, and C. Woolsey. AIAA Paper 2003-949, *Proc. 41<sup>st</sup> AIAA Aerospace Sciences Meeting*.

Other publications:

- [1] "Design and modeling of a two-stage towed sensor platform: A passively and actively stabilized towfish for experimental ocean science," E. M. Schuch\*, A. C. Linklater\*, and C. A. Woolsey. *Sea Technology* **47**(7), pp. 20-23, July 2006.
- [2] "Book Review: *Marine Control Systems: Guidance, Navigation, and Control of Ships, Rigs, and Underwater Vehicles* by T. I. Fossen," C. A. Woolsey. *AIAA Journal of Guidance, Control, and Dynamics* **28**(3), pp. 574-575, May-June 2005.

Ph.D. Dissertation:

*Energy Shaping and Dissipation: Underwater Vehicle Stabilization Using Internal Rotors*,  
 C. Woolsey, Princeton University, December 2000.  
 PhD Advisor: Prof. Naomi Leonard

**Sponsored Research Projects:**

**Summary of Research Funding**

Source	Number of Projects	Total Amount	Woolsey Component
External	25	\$7,870,254	\$3,110,197
Virginia Tech	1	\$23,435	\$23,435
Total	26	\$7,893,689	\$3,133,632

Projects directed by C. Woolsey (reverse chronological order by end date)

- [1] **Proposal Title:** Efficient Motion Control for Undersea Gliders: Experimental Implementation and Assessment  
**Principal Investigator:** C. Woolsey  
**Period of Performance:** January 1, 2011 to December 31, 2012  
**Sponsor:** Office of Naval Research  
**Amount:** \$209,929  
**Note:** Project coordinated with Dr. K. Morgansen (U. Washington)
- [2] **Proposal Title:** Support for "A Propulsion-Enabled Control System for Precise Submarine Maneuvering"  
**Principal Investigators:** W. Neu, D. Stilwell, and C. Woolsey (Lead)  
**Period of Performance:** April 1, 2011 to March 31, 2013  
**Sponsor:** Impact Technologies (NUWC-Newport flowthrough)

**Amount:** \$180,000  
**Woolsey Component:** \$60,000 (33%)

- [3] **Proposal Title:** Marine and Hydrokinetic Technology: Support for THOR, LLC  
**Principal Investigators:** C. Woolsey  
**Period of Performance:** January 1, 2011 to December 31, 2011  
**Sponsor:** Turner Hunt Ocean Renewable (DOE flowthrough)  
**Amount:** \$60,213
- [4] **Proposal Title:** Efficient Motion Control for Undersea Gliders: Implementation and Assessment Using *Seaglider*  
**Principal Investigators:** E. Cliff and C. Woolsey (Lead)  
**Period of Performance:** September 1, 2009 to December 31, 2010  
**Sponsor:** Office of Naval Research  
**Amount:** \$55,039  
**Woolsey Component:** \$27,520 (50%)  
**Note:** Project coordinated with Dr. K. Morgansen (U. Washington)
- [5] **Proposal Title:** UAV Flying Qualities Criteria Development and Evaluation  
**Principal Investigators:** W. Durham and C. Woolsey (Lead)  
**Period of Performance:** July 1, 2008 to September 30, 2010  
**Sponsor:** Naval Air Warfare Center (NAVAIR)  
**Amount:** \$166,450  
**Woolsey Component:** \$83,225 (50%)
- [6] **Proposal Title:** Evidence Based Approach to Improved Small UAV Reliability  
**Principal Investigators:** J. Marchman and C. Woolsey (Lead)  
**Period of Performance:** July 1, 2008 to December 10, 2009  
**Sponsor:** Naval Air Warfare Center (NAVAIR)  
**Amount:** \$134,673  
**Woolsey Component:** \$67,337 (50%)
- [7] **Proposal Title:** Motion Planning for Underwater Gliders  
**Principal Investigators:** E. Cliff and C. Woolsey (Lead)  
**Period of Performance:** October 1, 2007 to September 30, 2009  
**Sponsor:** Office of Naval Research  
**Amount:** \$213,044  
**Woolsey Component:** \$174,696 (82%)
- [8] **Proposal Title:** In-Flight Data Collection Using a N~ASK Transponder  
**Principal Investigators:** C. Woolsey  
**Period of Performance:** January 1, 2009 to August 15, 2009  
**Sponsor:** N~ASK, Inc.  
**Amount:** \$33,928  
**Woolsey Component:** \$33,928 (100%)
- [9] **Proposal Title:** Internally actuated lateral-directional maneuvering for a blended wing-body underwater glider  
**Principal Investigators:** C. Woolsey  
**Period of Performance:** May 15, 2005 to December 31, 2007  
**Sponsor:** Office of Naval Research  
**Amount:** \$259,688  
**Woolsey Component:** \$259,688 (100%)
- [10] **Proposal Title:** CAREER: Internal shape control for ocean and atmospheric vehicles (NSF Faculty Early Career Development Award)  
**Principal Investigators:** C. Woolsey  
**Period of Performance:** May 1, 2002 to April 30, 2007  
**Sponsor:** National Science Foundation

**Amount:** \$381,000  
**Woolsey Component:** \$381,000 (100%)

- [11] **Proposal Title:** Fleet applications of AUVs: A technology development roadmap  
**Principal Investigators:** W. Neu, D. Stilwell, and C. Woolsey (Lead)  
**Period of Performance:** May 15, 2006 to December 31, 2006  
**Sponsor:** Office of Naval Research  
**Amount:** \$27,694  
**Woolsey Component:** \$9416 (34%)
- [12] **Proposal Title:** Heterogeneous teams of autonomous vehicles: Advanced sensing and control  
**Principal Investigators:** D. Hong, N. Hovakimyan, M. Johnson, C. Reinholtz, D. Stilwell, A. Wicks, C. Woolsey (Lead), C. Wyatt  
**Period of Performance:** July 1, 2005 to June 30, 2006  
**Sponsor:** Office of Naval Research  
**Amount:** \$1,050,000  
**Woolsey Component:** \$180,712 (17%)  
**Note:** Project coordinated with investigators at Naval Postgraduate School
- [13] **Proposal Title:** Collaborative Research: A two-stage towing system for swath-mapping ocean turbulence  
**Principal Investigator:** C. Woolsey  
**Period of Performance:** August 16, 2002 to August 15, 2005  
**Sponsor:** National Science Foundation  
**Amount:** \$217,936  
**Woolsey Component:** \$217,936 (100%)  
**Note:** Project coordinated with Dr. A. Gargett (Old Dominion U.)
- [14] **Proposal Title:** Real-time flow-field estimation for cooperative autonomous underwater vehicle mission planning (Supplement to YIP Award to support collaboration with a U.S. Navy laboratory.)  
**Principal Investigators:** C. Woolsey  
**Period of Performance:** June 1, 2004 to June 30, 2005  
**Sponsor:** Office of Naval Research  
**Amount:** \$50,000  
**Woolsey Component:** \$50,000 (100%)
- [15] **Proposal Title:** Low velocity attitude control for underwater vehicles using internal actuators (ONR Young Investigator Program Award)  
**Principal Investigators:**  
**Period of Performance:** May 1, 2002 to April 30, 2005  
**Sponsor:** Office of Naval Research  
**Amount:** \$300,000  
**Woolsey Component:** \$300,000 (100%)
- [16] **Proposal Title:** A self-sustaining, boundary-layer-adapted system for terrain exploration and environmental sampling  
**Principal Investigators:** G. Hagerman, C. Woolsey (Lead)  
**Period of Performance:** October 1, 2004 to March 31, 2005  
**Sponsor:** NASA Institute for Advanced Concepts  
**Amount:** \$69,513  
**Woolsey Component:** \$47,424 (66%)
- [17] **Proposal Title:** Laboratory for control of mechanical systems  
**Principal Investigators:** C. Woolsey  
**Period of Performance:** Jan. 1, 2002 to Dec. 31, 2002  
**Sponsor:** Virginia Tech ASPIRES Program  
**Amount:** \$23,435  
**Woolsey Component:** \$23,435 (100%)

Projects directed by collaborators (reverse chronological order by end date)

- [18] **Proposal Title:** AFRL-VT Collaborative Center On Multidisciplinary Analysis And Design Of Future Aerospace Vehicles  
**Principal Investigators:** R. Batra, R. Canfield, M. Hajj, R. Kapania (Lead), W. Mason, M. Patil, D. Tafti, L. Watson, and C. Woolsey  
**Period of Performance:** December 22, 2008 to December 21, 2013  
**Sponsor:** Air Force Research Laboratory, WPAFB  
**Amount:** \$1,595,028  
**Woolsey Component:** \$79,751 (5%)
- [19] **Proposal Title:** A Hardware Testbed for Distributed Learning, Estimation and Approximation Theory with Sensor Vehicle Networks  
**Principal Investigators:** A. Kurdila (Lead), A. Leonessa, D. Stilwell, C. Woolsey  
**Period of Performance:** June 15, 2010 to June 14, 2011  
**Sponsor:** Army Research Office  
**Amount:** \$441,970  
**Woolsey Component:** \$110,493 (25%)
- [20] **Proposal Title:** Enhanced Riverine Drifter  
**Principal Investigators:** P. Diplas, D. Stilwell (Lead), and C. Woolsey  
**Period of Performance:** July 1, 2010 to April 30, 2011  
**Sponsor:** Barron Associates (ONR flowthrough)  
**Amount:** \$49,966  
**Woolsey Component:** \$16,655 (25%)
- [21] **Proposal Title:** Autonomous USV Navigation in Riverine Environments  
**Principal Investigators:** D. Stilwell (Lead) and C. Woolsey  
**Period of Performance:** September 1, 2009 to December 31, 2010  
**Sponsor:** Office of Naval Research  
**Amount:** \$259,969  
**Woolsey Component:** \$129,985 (50%)  
**Note:** Project coordinated with investigators at Naval Postgraduate School
- [22] **Proposal Title:** Experimental Scale Underwater Glider  
**Principal Investigators:** L. McCue-Weil (Lead) and C. Woolsey  
**Period of Performance:** May 6, 2010 to September 30, 2010  
**Sponsor:** University of Michigan (Naval Engineering Education Consortium)  
**Amount:** \$69,348  
**Woolsey Component:** \$34,674 (50%)
- [23] **Proposal Title:** USV Autonomy in Riverine Environments  
**Principal Investigators:** D. Stilwell (Lead) and C. Woolsey  
**Period of Performance:** May 1, 2008 to December 31, 2009  
**Sponsor:** Office of Naval Research  
**Amount:** \$381,757  
**Woolsey Component:** \$190,879 (50%)  
**Note:** Project coordinated with investigators at Naval Postgraduate School
- [24] **Proposal Title:** Design and Prototype Development of a Flight Vehicle for Large Event Surveillance  
**Principal Investigators:** J. Marchman (Lead) and C. Woolsey  
**Period of Performance:** August 1, 2007 to October 31, 2009  
**Sponsor:** Virginia Space Grant Consortium (flow-through from NAVAIR)  
**Amount:** \$143,533  
**Woolsey Component:** \$71,767 (50%)
- [25] **Proposal Title:** Coordinated sensing and control for surveillance and tracking by heterogeneous autonomous vehicle teams.

**Principal Investigators:** N. Hovakimyan, A. Kurdila, M. Roan, C. Reinholtz, D. Stilwell (Lead), A. Wicks, C. Woolsey, C. Wyatt  
**Period of Performance:** October 1, 2006 to September 30, 2007  
**Sponsor:** Office of Naval Research  
**Amount:** \$1,417,500  
**Woolsey Component:** \$226,000 (16%)  
**Note:** Project coordinated with investigators at Naval Postgraduate School

[26] **Proposal Title:** Adaptive sampling in dynamic environments using AUVs  
**Principal Investigators:** D. Stilwell (Lead), C. Woolsey  
**Period of Performance:** May 30, 2005 to May 29, 2006  
**Sponsor:** Office of Naval Research  
**Amount:** \$479,750  
**Woolsey Component:** \$86,969 (18%)  
**Note:** Project coordinated with investigators at Tulane University

### **Courses Taught:**

AOE 3034: Vehicle Vibration and Control  
AOE 3104: Aircraft Performance  
AOE 3134: Aircraft Stability and Control  
AOE 4004: Computer Aided Control System Design  
AOE 4334: Ship Dynamics  
ME 4015/16: Mechanical Engineering Senior Design  
AOE 5224: Linear Optimal Control Systems  
AOE 5344: Nonlinear Control of Mechanical Systems  
AOE 5774/ECE 5774/ME 5574: Nonlinear Systems Theory  
AOE 5984 (Fall 2001): Real-time Control (Special topics course; Co-taught with Prof. Chris Hall)

### **Advising:**

#### Post-Doctoral Scholars

##### Complete:

Dr. Hye-Young Kim	Co-advised with Dr. C. Hall
Dr. C. Konda Reddy	Co-advised with Dr. N. Hovakimyan
Dr. Lili Ma	Co-advised with Dr. N. Hovakimyan

#### Graduate Research Assistants (Ph.D. Candidates)

##### Complete:

Chris Cotting (Ph.D. A.E., 2010)	Primary Advisor (with Dr. W. Durham)
Amanda Young Dippold (Ph.D. A.E., 2009)	Secondary Advisor (with Dr. N. Hovakimyan)
Lt. Col. Robert Kraus, U.S.A.F. (Ph.D. A.E., 2010)	Primary Advisor (with Dr. E. Cliff)
Nina Mahmoudian (Ph.D. A.E., 2009)	Sole Advisor
Chevva Konda Reddy (Ph.D. E.S.M., 2005)	Primary Advisor (with Dr. A. Nayfeh)
Laszlo Techy (Ph.D. A.E., 2009)	Primary Advisor (with Dr. D. Schmale, III)

##### Current:

Eddie Hale (Ph.D. A.E. expected May 2014)	Primary Advisory (with Dr. M. Patil)
Christian Sonnenburg (Ph.D. A.E. expected May 2012)	Primary Advisor (with Dr. D. Stilwell)
Artur Wolek (Ph.D. A.E. expected May 2014)	Sole Advisor

#### Graduate Research Assistants (M.S. Candidates, Thesis Option)

##### Complete:

Jesse Geisbert (M.S. O.E., 2007)  
Amy Linklater (M.S. A.E., 2005)  
Michael Morrow (M.S. A.E., 2005)  
Justin Murtha (M.S. A.E., 2009)

Chris Nickell (M.S. A.E., 2005)  
Eric Schuch (M.S. A.E., 2004)  
Chris Schultz (M.S. A.E., 2006)

Current:

Ankit Ganeriwal (M.S. A.E., expected 2013)  
Mark Palframan (M.S. A.E., expected 2013)  
Christian Sulton (M.S. A.E., expected 2013)

Undergraduate Research Assistants

Class of 2003 (5)

Sam Butcher  
Laura Elliott (Bucknell U.)  
Alec Gosse  
Conor Haines  
Mike Metheny

Class of 2004 (3)

Nick Bartick  
Andy Parker  
William Whitacre

Class of 2005 (3)

Nate Lambeth  
Brian McCarter  
Jacqueline Snow

Class of 2006 (6)

Desti Alemayehu  
Steve Butcher  
Elizabeth Eaton  
Imraan Faruque  
Jason Roadman  
Sade Sparbanie

Class of 2007 (6)

Zarrin Chua  
Reid Doughten  
Jeff Kaeli  
Justin Murtha

Brad Pullins  
Travis Schrock (U. Penn)

Class of 2008 (5)

Robert Briggs  
Evan Gray  
Cory Kaser  
Phil Pesce  
Christian Sonnenburg

Class of 2009 (2)

Chris Olien  
Grant Parrish

Class of 2010 (20)

Micah Boswell  
Nathan Carlos  
Julien Fenouil  
Ivan Fernandez  
Damir Grljevic  
Laurence Hale  
Jonathan Hall  
Ryan Holcombe  
Gerry Hudak  
Sadnima Khan  
Peter Marquis  
Jonathan Murrow  
Stephen Portner  
Jason Price  
Craig Sossi

Allen Steinert  
Bogdan Szyszko  
Logan Thomas  
Vishnu Vinay  
Artur Wolek

Class of 2011 (4)

Erin Dewillie  
Richie Slocum  
Helena Smith  
Vahagn Stepanyan

Class of 2012 (12)

David Allen  
Vamsee Gunduboina  
Paul Johnson  
Chris Kevorkian  
Tyler Lewandowski  
Carlos Rodriguez  
Edward Rooney  
Nitesh Shah  
Younes Taleb  
Greg Woodhouse  
Lauren Woodward  
Victor Zamora

Class of 2013 (2)

Chris Brouse  
Pete Gunderson