Dr. Shane Ross and the Ross Dynamics Lab - Brief description and bio

The Ross Dynamics Lab at Virginia Tech specializes in applications of nonlinear dynamics, performing mathematical modeling, simulation, visualization, and experiments with applications in several different fields, including: patterns of dispersal in oceanic and atmospheric flows, passive and active aerodynamic gliding, dynamic buckling of flexible structures, transport across the air-water interface, orbital mechanics, chemical physics, and causality analysis in complex natural and artificial systems.

Dr. Ross is a professor of dynamical systems and fluid dynamics and the director of the Engineering Mechanics graduate program of the department of Biomedical Engineering and Mechanics, an interdisciplinary department dedicated to research and education emphasizing breadth and depth in the fundamental principles of mechanics and mathematics, including applications to bioengineering and biomechanics.

Dr. Ross has advanced the state-of-the-art in the analysis and visualization of environmental transport. He initiated the use of atmospheric transport barriers in understanding the biological invasion of microorganisms, particularly plant diseases of agricultural crops. He has done field work and Lagrangian transport computations analyzing the dispersal of hazardous material in aquatic environments, including lakes and oceans, with side applications to spread of debris and persons in search-and-rescue scenarios.

Dr. Ross founded an interdisciplinary graduate education program on biological transport (called Biotrans) that began in 2010 and has now cross-trained over 25 PhD students at the engineering-biology interface. He helped shepherd the program's transition to sustained internal funding, contributing to an infrastructure of interdisciplinary discovery at the intersection of engineering and biology which will have impacts for years to come.

He is author of more than 150 publications, including nearly 70 journal articles (over 7000 citations, h-index of 32) in the fields of mathematical modeling and nonlinear dynamics, with application to problems in fluid mechanics, disease spread, orbital mechanics, bio-locomotion, structural mechanics, vehicle control and chemical physics. He has spoken to thousands of people at dozens of universities worldwide including MIT, Caltech, Stanford, Cornell, Princeton, UCLA, Duke, U. Michigan, U. Maryland, Texas A&M, UNC Chapel Hill, TU Munich, U. Toronto, U. Warwick, ETH Zurich, and U. Barcelona, and at several prestigious international forums, including the British Science Festival and the Zurich Physics Colloquium. His research has been featured in the pages of *Science, Scientific American, New Scientist, Science News, American Scientist, Astronomy,* the *Times of London*, the BBC, and several other international news outlets, including those in India, Russia, Finland, Poland, Turkey, Brazil, and China.

He has obtained externally sponsored research projects totaling $10 million, with a personal share of over $2 million, including a prestigious NSF CAREER award in the Dynamical Systems program. He has supervised 12 PhD and 2 MS students to the completion of their degrees and is currently supervising 5 more, all of whom have gone on to positions in academia, government, or industry. Dr. Ross' work on orbital dynamics initiated the use of dynamical systems methods for mission design among the international astrodynamics community, particularly invariant manifold theory, and has received several awards from NASA. He co-authored an open-access book on the subject, *Dynamical Systems, the Three-Body Problem, and Space Mission Design*. He has a bachelor's degree in physics and a PhD in control and dynamical systems, both from Caltech (California Institute of Technology).