

May 15, 2008

PROMOTION RECOMMENDATION

The University of Michigan

College of Engineering

Carlos E. Cesnik, associate professor of aerospace engineering, with tenure, Department of Aerospace Engineering, College of Engineering, is recommended for promotion to professor of aerospace engineering, with tenure, Department of Aerospace Engineering, College of Engineering.

Academic Degrees:

Ph.D.	1994	Georgia Institute of Technology, Aerospace Engineering, Atlanta, GA
M.S.	1991	Georgia Institute of Technology, Aerospace Engineering, Atlanta, GA
Master	1989	Instituto Tecnológico de Aeronáutica, Aeronautical Engineering, Brazil
Engineering Degree	1987	Instituto Tecnológico de Aeronáutica, Aeronautical Engineering, Brazil

Professional Record:

2001-present	Associate Professor (with tenure), Department of Aerospace Engineering, University of Michigan
2001	Associate Professor of Aeronautics and Astronautics, MIT
1996-2001	Boeing Assistant Professor of Aeronautics and Astronautics, MIT
1994-1996	Post-doctoral Fellow, Georgia Institute of Technology
1987-1989	Research Engineer, EMBRAER, Brazil

Summary of Evaluation:

Teaching: Professor Cesnik has made substantial contributions to our classroom teaching. At the undergraduate level, he has improved the content of our Structures course sequence, as well as the capstone aircraft design course. He has also made significant contributions to the teaching of courses at the graduate-level: *Structural Dynamics* (AE543), *Mechanics of Composites* (AE516), and *Aeroelasticity* (AE544). His Q1 and Q2 teaching scores that average 4.2 and 4.4, respectively are just one measure of his effectiveness in the classroom. As letters from students show, Professor Cesnik's performance is appreciated more than even his student evaluation scores suggest. He truly advances our students' basic knowledge and technical skills, and helps them be well prepared for their careers. Professor Cesnik has a healthy number of graduate and undergraduate students working with him and conducting research and independent study. He has graduated six Ph.D. students (three of them at Michigan) and is currently serving as the principal advisor to nine Ph.D. students. He has mentored approximately 20 masters and 20 undergraduate students for their research projects.

Research: Professor Cesnik's research program is very strong, as evidenced by his substantial success in external grant competitions, and the number of his peer reviewed publications. His research, currently at a level of more than \$600K/yr, has been funded by numerous federal agencies and industry. He has also been very effective in collaborating with colleagues who complement and augment his expertise. All references have clearly emphasized his high quality research and substantial visibility in the research community. In particular, he has made important contributions in the following areas:

- Substantially advanced the understanding of numerical modeling of composite beams, particularly in the presence of embedded distributed anisotropic piezocomposite actuation. Part of this approach is now in MSC.Nastran, the *de-facto* aerospace industry standard finite element software for structural analysis.
- Established and developed a framework for the analysis and design of active twist rotors for helicopter vibration reduction; conducted the first-ever forward flight test of an active twist rotor system, first open- then closed-loop to demonstrate system effectiveness.

- Developed a novel and practical solution to the coupled nonlinear aeroelasticity and flight dynamics response of very flexible aircraft that is applicable to optimization of unconventional configurations.
- Developed a novel 3D-elasticity solution to the generation and propagation of guided Lamb waves in structures with permanently-mounted finite-size piezoelectric transducers.
- Created a new piezoelectric transducer that can scan efficiently large areas in a structure for damage. This work can make critical contributions to flight vehicle's health monitoring, a topic of highest priority to the development of future aerospace vehicles; e.g., Boeing's 787 Dreamliner and next generation spacecraft.

He received the ASME/Boeing Structures & Materials Award for best paper; 42nd Structures, Structural Dynamics and Materials Conference, 2001 (from a total of over 500 papers).

Recent and Significant Publications:

- Shearer, C. M. and Cesnik, C. E. S., "Nonlinear Flight Dynamics of Very Flexible Aircraft," *Journal of Aircraft*, Vol. 44, No. 5, September-October 2007, pp. 1528-1545.
- Raghavan, A. and Cesnik, C. E. S., "Finite-dimension Piezoelectric Transducer Modeling for Lamb-wave Based Structural Health Monitoring," *Smart Materials and Structures*, Vol. 14, 2005, pp. 1448-1461.
- Palacios, R. and Cesnik, C. E. S., "Cross-Sectional Analysis of Non-Homogeneous Anisotropic Active Slender Structures," *American Institute of Aeronautics and Astronautics Journal*, Vol. 43, No. 12, 2005, pp. 2624-2638.
- Shin, S.-J., Cesnik, C. E. S., and Hall, S. R., "Closed-loop Control Test of the NASA/Army/MIT Active Twist Rotor for Vibration Reduction," *Journal of the American Helicopter Society*, Vol. 50, No. 2, 2005, pp. 178-194.
- Thepvongs, S., Cesnik, C. E. S., and Voutsinas, S.G., "Numerical Investigation of Integral Twist Actuation for BVI Noise Reduction," *Proceedings of the American Helicopter Society 62nd Annual Forum*, Phoenix, Arizona, May 9-11, 2006, pp. 919-934.
- Su, W. and Cesnik, C. E. S., "Dynamic Response of Highly Flexible Flying Wings," *Proceedings of the 47th AIAA/ASME/ASCE/AHS/ASC Structural, Structural Dynamics and Materials Conference*, Newport, Rhode Island, May 1-4, 2006, AIAA-2006-1636.

Service: Professor Cesnik has a very extensive list of service activities, within the University as well as in the international professional community. His more notable professional activities include serving as technical chair and general chair for conferences for three important conferences. He will again serve as technical chair in 2008 of the 50th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials conference. Professor Cesnik also serves as associate editor of two journals. In addition to these activities, Professor Cesnik has been an active member of the NATO Research and Technology Organizations Working Group, the AIAA Structural Dynamics Technical Committee and the AIAA Adaptive Structures Technical Committee. He previously has served on the AHS Technical Council and the AHS Dynamics Technical Committee. Professor Cesnik has been a reviewer for numerous journals.

Professor Cesnik's service to the Department and College has been excellent. He has served on search committees, including the search for the current AERO department chair. He currently serves as AERO program advisor and advisor to the AIAA student section. In addition, Professor Cesnik has served on the College Curriculum Committee. Given Professor Cesnik's outstanding service record, it is likely he will be increasingly tapped for leadership roles.

External Reviewers:

Reviewer A: "...there is no doubt in my mind that he is one of the finest researchers in modeling and aeroelastic analysis of advanced composite blades. ...Overall, his research contributions show creativity, relevance and diversity."

Reviewer B: "With respect to his standing in the field, I would count him among the national leaders in his age cohort. Indeed, I cannot identify anyone that I would rank above him."

Reviewer C: "...his work on modeling piezoelectric transducer-structure interaction is quite unique."

Reviewer D: "I find his recent work in SHM...to be extremely significant and outstanding. I believe these publications led to his recent AFOSR grant in structural health monitoring, currently a very competitive area of research."

Reviewer E: "...Dr. Cesnik is very talented and industrious – features that in combination with his excellent academic preparation, have enabled him to take on multidisciplinary problems that few other individuals could tackle."

Reviewer F: "New papers...on nonlinear flight dynamics and the trajectory control of very flexible aircraft are ahead of any other work in this area. In the opinion of colleagues from [my institution], who develop technology for HALE vehicle design and who share views with me, Carlos is the lead researcher in this area. ... Carlos is the best, in my view, of the aeroelasticity professors of his academic age group."

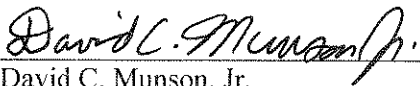
Reviewer G: "...his work displays admirable judgment in his choices of problem areas and expertise that has both depth and breadth. It is unusual, in my experience, that a principal investigator shows such capability and willingness in the exploitation of both theoretical and numerical analysis techniques as well as testing applications."

Reviewer H: "As an aeroelastician, he has integrated active structures, active control, aeromechanics, and flight mechanics in a manner that is unparalleled for someone of his age and experience."

Reviewer I: "It is my opinion that Dr. Cesnik is a world-class researcher in smart structures, composite rotor aeroelasticity, structural health monitoring and the emerging field of nonlinear flight mechanics."

Reviewer J: "He is well on his way to becoming a distinguished member of our SDM technical community. I would dearly love to have him or someone of his stature here at [my institution]."

Summary of Recommendation: Professor Cesnik has an excellent record of achievement, which has brought visibility and recognition to the University of Michigan. Rarely do we see a colleague exhibiting such deep commitments to teaching, research, and the institution's well being, performing them all with such a high degree of competence and effectiveness, and making impacts on students so broadly. It is with the support of the College of Engineering Executive Committee that I recommend Carlos E. Cesnik for promotion to professor of aerospace engineering, with tenure, Department of Aerospace Engineering, College of Engineering



David C. Munson, Jr.
Robert J. Vlasic Dean of Engineering
College of Engineering

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