Approved by the Regents
May 15, 2014

PROMOTION RECOMMENDATION
University of Michigan
College of Engineering
Department of Aerospace Engineering

Luis P. Bernal, 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:

Dc.Ing.	1983	Polytechnical University of Madrid, School of Aeronautics, Spain
Ph.D.	1981	California Institute of Technology, Aeronautics, Pasadena, CA
Engineering	1971	Aeronautical Engineer - Polytechnical University of Madrid, Spain

Professional Record:

1990 – present	Associate Professor (with tenure), Department of Aerospace Engineering, University of Michigan
1984 – 1990	Assistant Professor, Department of Aerospace Engineering, University of Michigan
1981 – 1983	Senior Scientist, Fluid Dynamics Group, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA

Summary of Evaluation:

Teaching: Professor Bernal has made substantial contributions to the teaching mission of the department. He has served as the program advisor for the last eight years, meeting with almost every undergraduate student several times each. He has advised major student projects such as the Solar Bubbles solar powered UAV, the Student Space Systems Fabrication Laboratory (S3FL), and two Space Shuttle experiments. He has taught 12 courses, including a laboratory class (AE 521) and he co-taught the capstone Aircraft Design course (AE 481). His Q1 and Q2 scores have averaged above 4.0 over his last 12 courses. Professor Bernal is well-regarded by his students, as is evident from the many positive comments from student letters received. He has graduated 15 Ph.D. students as chair or co-chair, including two students who flew experiments on the Space Shuttle.

Research: Professor Bernal's research is a combination of theory backed up by careful experiments and has led to a number of important contributions. From his early work in vortex structure in mixing layers to his current work in vortex structures in pitching and plunging airfoils, external reviewers considered these to be seminal works, reported in prestigious journals. His research has touched applications ranging from micro air vehicles to understanding the aerodynamics of automobiles and trucks. This last effort has resulted in Navistar Corporation investing in the college's wind tunnel and in on-going talks with USCAR, a conglomerate of automotive companies focusing on aerodynamics of ground vehicles. Professor Bernal has 33 refereed publications and numerous refereed conference summaries. His curriculum vitae also lists 28 invited presentations. In addition, he holds two patents for microvalves. Professor Bernal's work continues to have a positive impact on the growth and success of the department.

Recent and Significant Publications:

R.B.R. Vandenheed, L.P. Bernal, C.L. Morrison, A. Gogulapati, P.P. Friedmann, C.-K. Kang and W. Shyy, "Experiments on Bio-Inspired Hover Kinematics with an Unsteady Vortex Model and Computational Fluid Dynamics," accepted, *AIAA Journal*, 2013.

D. Yeo, E. Atkins, L.P. Bernal and W. Shyy, "Experimental characterization of Lift on a Rigid Flapping Wing," accepted, *Journal of Aircraft*, 2013.

K. Granlund, M.V. Ol and L.P. Bernal, "Quasi-Steady Response of Free-to-Pivot Flat Plates in Hover," *Journal of Fluids and Structures*, 40:337-355, 2013.

Y.S. Baik, L.P. Bernal, K. Granlund and M.V. Ol, "Unsteady Force Generation and Vortex Fynamics of Pitching and Plunging Airfoils," *Journal of Fluid Mechanics*, 709:37-68, 2012.

M.V. Ol, L. Bernal, C.-K. Kang and W. Shyy, "Shallow and deep dynamic stall for flapping low Reynolds number airfoils," *Experiments in Fluids*, 46:883-901, 2009.

M.J. Martain, K.J. Scavazze, I.D. Boyd and L.P. Bernal, "Design of a Low-Turbulence, Low-Pressure, Wind-Tunnel for Micro-Aerodynamics," *Journal of Fluids Engineering*, 128(5): 1045-52, 2006.

K. Madnia and L.P. Bernal, "Interaction of a Turbulent Round Jet with the Free Surface," *Journal of Fluid Mechanics*, 261:305-332, 1994.

L.P. Bernal and A. Roshko, "Streamwise Vortex Structure in Plane Mixing Layers," *Journal of Fluid Mechanics*, 170:499-525, 1986.

Service: At the department level, Professor Bernal has served as program advisor for the last eight years. He has also served on the Undergraduate Committee since 2004 and has been serving as the chair since 2009. His activities at the college level include serving as chair of the College Curriculum Committee, the Rules Committee, and the Library Committee. He also is a previous University Senate Assembly member. His service record external to the university includes membership on the AIAA Fluid Dynamics Technical Committee, NSF Major Instrumentation proposal review panel, NASA Microgravity Fluids review panel, and the Air Force Office of Scientific Research Turbulence program panel.

External Reviewers:

Reviewer A: "Anyone planning to work in this field today would have to include Bernal's work on their list of required reading...I admire the variety and world-class quality of Professor Bernal's research...There is no question in my mind that, based on the quality and breadth of his research, Professor Bernal should be promoted to Full Professor."

Reviewer B: "Professor Bernal's long professional career fully deserves this promotion. He is a highly respected researcher...His paper...has been cited over 300 times and has become mandatory reading for any new researcher in the area ...this work alone puts him heads and shoulders above 90% of the full professors working in fluid mechanics at leading engineering schools in the nation."

Reviewer C: "I find his work to be of very high quality...I would definitely recommend that Luis be promoted. I am actually surprised that he is not."

Reviewer D: "The diversity of Professor Bernal's research is remarkable. He has made highly regarded contributions to the areas of mixing layer flows, flow interactions with a free surface, microgravity flows...bio-inspired flight, and...holographic particle image velocimetry...His record compares well with those holding the rank of Professor at leading universities."

Reviewer E: "His work on MAVs and flapping wings is excellent and exciting...I do recommend Dr. Bernal for promotion to full professor."

Reviewer F: "...he has achieved a status commensurate with the appointment of a Full Professor at a major research institution...Dr. Bernal has established prominence in his peer community, where he is regarded as an excellent and creative experimentalist in fluid mechanics and turbulence...I strongly support his promotion."

Summary of Recommendation: Professor Bernal's research productivity has experienced impressive growth, as represented by his journal publications and the breadth of his research contributions. He has branched into the new areas of flapping wing aerodynamics for UAVs and MEMS devices for microactuators. He is considered a well-regarded teacher and mentor and he has provided valuable service to his department, the university and his profession. It is with the support of the College of Engineering Executive Committee that I recommend Luis P. Bernal for promotion to professor of aerospace of 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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