**Approved by the Regents**
**May 18, 2017**

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

Karthikeyan Duraisamy assistant professor of aerospace engineering, Department of Aerospace Engineering, College of Engineering, is recommended for promotion to associate professor of aerospace engineering, with tenure, Department of Aerospace Engineering, College of Engineering.

Academic Degrees:

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| Ph.D. | 2005 | University of Maryland, Aerospace Engineering, College Park, MD |
| M.S. | 2005 | University of Maryland, Mathematics, College Park, MD |
| M.E. | 2000 | Indian Institute of Science, Aerospace Engineering, India |
| B.E. | 1998 | Coimbatore Institute of Technology, Mechanical Engineering, India |

Professional Record:

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| 2013 – present | Assistant Professor, Department of Aerospace Engineering, University of Michigan |
| 2009 – 2013 | Consulting Assistant Professor, Department of Aeronautics and Astronautics, Stanford University, Palo Alto, CA |
| 2007 – 2009 | Lecturer, Department of Aerospace Engineering, University of Glasgow, Glasgow, UK. |
| 2005 – 2006 | Assistant Research Scientist, Department of Aerospace Engineering, University of Maryland, College Park, MD |

Summary of Evaluation:

Teaching: Professor Duraisamy is an excellent educator through teaching and mentoring. His teaching scores are comparable with those of our best instructors. The letters from students indicate a deep compassion and concern for student learning. He creates a more interactive classroom by sincerely encouraging students to ask questions. He has taught a required junior level course and created and taught two new courses at the graduate level. His mentoring of research from undergraduate projects through Ph.D. dissertations and post-doctoral supervision is also strong. He has graduated five Ph.D. students with 10 more in progress. He is also actively advising several undergraduate and M.S. students as well as post-doctoral researchers.

Research: Professor Duraisamy's research centers on fundamental questions in flow physics, and how to harness physics, data, modeling, numerics and computing to answer those questions. His work has applications to helicopters, wind turbines and aerospace propulsion systems such as scramjets. He is known for his work in data-driven computational physics, modeling of turbulent flows, applications of CFD to helicopter flows and the quantification of uncertainty in computational models. He has published in the best and most appropriate journals and conference venues. His research is being supported by an impressive number of agencies. His lead role in several large collaborative grants is particularly impressive. Most important, he is

fast becoming a leader in the area of data science for aerospace applications. He has published over 30 journal articles (including three accepted) and is responsible for $5.8 million in external funding (his share).

Recent and Significant Publications:

Paris, E. and Duraisamy, K., "Non-Markovian Closure Models for Large Eddy Simulations Using the Mori-Zwanzig Formalism," *Physical Review Fluids*, 2017, 30 pages.

Parish, E. and Duraisamy, K., "A Paradigm for Data-driven Predictive Modeling Using Field Inversion and Machine Learning," *Journal of Computational Physics*, Vol. 305, 2016, 16 pages.

Singh, A. and Duraisamy, K., "Using Field Inversion to Quantify Functional Errors in Turbulence Closures," *Physics of Fluids*, Vol. 28, 2016, 22 pages.

Duraisamy, K. and Chandrashekar, P., "Goal-oriented Estimation and Control of Numerical Error using Stochastic Adjoints," *Computers and Fluids*, Vol. 66, 2012, 11 pages.

Aranake, A., Lakshminarayan, V. and Duraisamy, K., "Analysis and Design of Shrouded Wind Turbines," ASME Wind Turbine Symposium, Dallas, January 2013.

Service: Professor Duraisamy's service record is strong, having made an impact in the department's computing curriculum committee and strategic planning exercise. He also serves on the department's Graduate Committee. He is very involved in the university's Data Science Initiative, serving on the Steering Committee for the Michigan Institute of Data Science, serving as the director of the Center for Data-Driven Computational Science and as associate director for research for the Michigan Institute of Computational Discovery in Engineering. He also has contributed to his professional community by serving as a symposium organizer, a proposal reviewer and a reviewer for over 20 journals.

External Reviewers:

Reviewer A: "Prof. Duraisamy has a very strong record of productivity, and seems especially adept at amplifying his impact by developing strong collaborations with a number of junior and senior researchers. … he would earn tenure in any top-ranked engineering program … ."

Reviewer B: "Karthik's sheer intellectual strength, excellent command of many branches of applied mathematics and applied mechanics, excellent intuition, diverse interests, amazing productivity, and leadership skills put him in a league of his own. On the basis of his outstanding achievements to date, I am confident that he is a rising star."

Reviewer C: "He has now been the senior author for multiple papers in what I consider top journals in fluid mechanics and computation … ."

Reviewer D: "I have been particularly impressed with his bold ideas and interdisciplinary knowledge as well as his ability to revisit classical problems in fluid mechanics, such as turbulence closure problems and separation, and develop a new paradigm in data-driven computational science. He is one of the few leaders in this emerging paradigm. … He is one of the world's best and certainly a top-three in his age-bracket in this emerging and hugely important field…"

Reviewer E: "I believe he is one of the very top [junior] people working in his field today. … I have observed that Karthik has often been a driving force in the collaborative interactions among his colleagues."

Reviewer F: "Professor Duraisamy is among the pioneers in establishing these new directions [in 'Big Data' applications in engineering]. … He is doing all the right things, including publishing innovative research that he has formulated and initiated, he is supervising doctoral students, his total number of publications is good, and I believe that he is on his way to be recognized as a major contributor to the current state-of-the-art in his research area."

Reviewer G: "…I am enthusiastic about the scholarly value of Dr. Duraisamy's current research focus on data-driven modeling and uncertainty quantification in turbulent flows. … and I believe that Dr. Duraisamy is well positioned to become a leader in the area."

Summary of Recommendation: Professor Duraisamy is fast becoming a star in the emerging area of data science. His service and teaching are excellent and he is on his way to establishing a national identity in data driven computational physics. It is with the support of the College of Engineering Executive Committee that I recommend Karthikeyan Duraisamy for promotion to associate professor of aerospace engineering, with tenure, Department of Aerospace Engineering, College of Engineering.

Alec D. Gallimore, Ph.D.
Robert J. Vlasic Dean of Engineering
College of Engineering

May 2017