Approved by the Regents
May 19, 2022

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

Benjamin A. Jorns, 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:

Ph.D.	2012	Princeton University, Mechanical and Aerospace Engineering, Princeton, NJ
M.A.	2009	Princeton University, Mechanical and Aerospace Engineering, Princeton, NJ
B.S.	2007	Yale University, Physics, New Haven, CT

Professional Record:

2017 – present	Assistant Professor, Department of Aerospace Engineering, University of Michigan
2013 – 2016	Technologist, Electric Propulsion Group (353B), Jet Propulsion Laboratory, Pasadena, CA
2013 – 2015	Lecturer, Department of Mechanical and Aerospace Engineering, University of California, Los Angeles, CA

Summary of Evaluation:

Teaching: Professor Jorns has made unique contributions to the Aerospace curriculum. He teaches three courses in rocket propulsion, which include modern electric propulsion for NASA space missions. Each year he has taught one large undergraduate course (AE 335 Aerospace Propulsion) and one moderate-sized graduate course (AE 535 Rocket Propulsion or AE 536 Electric Propulsion). His courses are among the most popular in the department. He brings his experience from working at the Jet Propulsion Lab in Pasadena CA, where he collaborated with leading rocket scientists on space mission projects. He has teaching skills that are unique within his department. He has modernized both rocket propulsion courses to include the recent efforts to commercialize the access to space (such as by Space-X). He also added detailed information about recent NASA space missions, based on his JPL work experience. His Q2 scores for all his courses have been over 4.5. He is the chair of 15 Ph.D. students, graduating two with another four to graduate this year. He has also co-chaired another six Ph.D. students. In addition, he has advised seven M.S. degree projects and 22 undergraduate student projects, all of which are related to his research. Professor Jorns is the founding mentor of MAISE (Michigan Advanced In-Space propulsion Engineers), an all-women undergraduate research team. Since 2018, he has mentored this team which is dedicated to building demonstration electric thruster experiments that are oriented toward a general audience.

Research: Professor Jorns' research falls into three categories. The first is electric propulsion technology; he has developed advanced concepts that represent the next "leap forward" for in-space propulsion. These include high-power concepts designed to operate above 30 kW (nested Hall thrusters and field reversed configuration thrusters) as well as micro-propulsion systems for CubeSat missions. The second and third areas of his research are programs he initiated entirely on his own. His AFOSR Young Investigator Program award is "Data-driven Models for Prediction and Control of Plasma Processes and Applications with Poorly Understood Physics." He is developing new ways to implement real-time optimization of low temperature plasmas that are widely used for materials

processing, water purification, and electric propulsion. His third area of interest is the new area of stability of electric propulsion systems. He combines new tools in data-driven learning, high speed, non-invasive diagnostics, and linear theory to establish stability criteria for active control plasma instabilities. Professor Jorns' research activities are supported by grants awarded by NASA, the U.S. Air Force, JPL, and companies such as Aerojet and Lockheed Martin. He has published over 30 journal articles and over 90 conference papers and has given more than ten invited presentations at national conferences and at universities.

Professor Jorns has received several research awards since joining Michigan in 2017 including the AIAA Lawrence Sperry Award. This is the AIAA premiere award for a notable contribution made by a junior person, to the advancement of aeronautics or astronautics. Only one Sperry award is given each year, and the candidates are from universities throughout the world and from NASA and other government agencies. Four of his journal papers appearing in the prestigious journal *Physics of Plasmas* were selected for the Editor's Pick or Featured Article. Three other papers were selected by the AIAA for Best Paper awards in electric propulsion. In addition, Professor Jorns received an Air Force Office of Scientific Research Young Investigator Program Award.

Recent and Significant Publications:

B. Jorns, S. Cusson, E. Dale, Z. Brown, "Non-classical Electron Transport in the Cathode Plume of a Hall Effect Thruster," *Physics of Plasmas* (Featured Article). 2020; 27(022311).

Z. Brown, B. Jorns, "Spatial Evolution of Small Wavelength Fluctuations in a Hall Thruster," *Physics of Plasmas*, 2019; 26(113504).

E. Dale, B. Jorns, "Non-Invasive Time-resolved Measurements of Anomalous Collision Frequency in a Hall Thruster," *Physics of Plasmas*, 2019; 26(1, 013516).

B. Jorns, "Predictive, Data-Driven Model for the Anomalous Electron Collision Frequency in a Hall Effect Thruster," *Plasma Sources Science and Technology*, 2018; 27(10): 1361-6595.

B. Jorns, I. Mikellides, D. Goebel, "Ion Acoustic Turbulence in a 100-A LaB6 Hollow Cathode," *Physical Review E*, 2014; 90(063106).

Service: Professor Jorns has served on several national committees. He is an associate editor of *Frontiers in Space Technologies: Space Propulsion*. His appointment as an associate editor, while still an assistant professor, is a unique honor. He was the lead guest editor of the Special Issue, "Physics of Electric Propulsion," in the *Journal of Applied Physics* (2021). He served on the program committee for the American Physical Society meeting, division of Plasma Physics. He is the chair of the educational outreach committee of the AIAA Electric Propulsion Technical Committee. His internal service includes his role as the faculty mentor to the AIAA student branch, which regularly hosts seminars and dinners; it also organizes student mentors who provide academic help to other students. He has also been a member of the Aero Strategic Planning Committee, the Aero Space Allocation Advisory Committee, and the 2021 Aero Faculty Search Committee. In addition to his work with MAISE, Professor Jorns coordinated a visit to his laboratory by popular science news outlet "Seeker." The resulting YouTube video "The X3 Ion Thruster is Here," has received 1.5 million views. He has conducted laboratory tours for the Center for Engineering Diversity and Outreach (CEDO) summer program. He has participated in the APS Division of Plasma Physics expo for K-8. Recently, he was faculty mentor for Rocket Scientists for a Half Day, at a local Ann Arbor camp for middle schoolers.

External Reviewers:

Reviewer A: "Ben checks all of the boxes. I see no reason for the School to not move this case forward and I believe that his record would meet the case for promotion [at my institution]."

Reviewer B: "He has passed with success the step to become an independent scientist by bringing enough resources (secured funds and recruited PhD students). Its [sic] research contributions are highly recognized by the US and international communities. Its [sic] high level of publications in peer-reviewed journal testifies to his excellent mastery in the field of electric propulsion."

Reviewer C: "[He has] a very healthy number of citations to his works (1300)…shows his scholarly impact is substantial... Prof. Jorns is at or near the top of a very select group of outstanding young researchers. ...his work certainly meets the requirements for tenure in our department.

Reviewer D: "I believe the quality, quantity and scholarly impact of Dr. Jorns's works are excellent. ... Dr. Jorns stands at the top of his peer group...his contributions rival and even exceed those … at other top ranked programs…"

Reviewer E: "There is *no doubt* that Dr. Jorns would be awarded Tenure at [my institution] based on his current body of work. …he could probably be considered for Full Professor at this stage…"

Summary of Recommendation: Professor Jorns has excelled in research, teaching, and service. He is recognized by his colleagues at Michigan and beyond, and his students, as an outstanding member of the faculty of the Department of Aerospace Engineering. It is with the support of the College of Engineering Executive Committee that I recommend Benjamin A. Jorns for promotion to associate professor of aerospace engineering, with tenure, Department of Aerospace Engineering.

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

May 2022