College of Engineering
UNIVERSITY OF WISCONSIN–MADISON

FALL 2026 NEWSLETTER

DEPARTMENT OF

MECHANICAL ENGINEERING





Greetings from Madison!

At 150 years, our department's growth is still accelerating, with the launch of the aerospace engineering undergraduate degree program in fall 2026 and a first-year class that is 20% larger than in 2025. That momentum shaped our fall faculty and staff retreat at the UW-Madison Arboretum. On a beautiful late-summer day, we explored how to turn growth into richer student experiences and stronger research collaborations addressing societal challenges. I left energized by our shared ambitions and deeply grateful for the colleagues I have the privilege of working with every day.



A successful spring hiring effort is bringing eight new faculty to the department. Shaoting Lin, Douglas Carter and Chloe Dedic joined us this fall, establishing research programs in polymeric materials, supersonic flows and laser diagnostics. Five more—Jacob McFarland, Michael Wadas, Daniel Pickard, Heather Kim and Emma Lenz—will arrive in January 2027. Their collective expertise in high-speed flows, turbulence, polymers and bioelectronics will expand research partnerships and student learning opportunities across aerospace and health.

Our students' curiosity and initiative are equally evident, from research in soft robotics and reusable rocket controls to 4D-printed implants for reconstructive surgery. Competition team highlights include the Wisconsin Autonomous team's 3rd place overall finish across the full five-year SAE AutoDrive II Challenge; Wisconsin Racing's design win and 6th place overall finish in Formula SAE Electric; WiscWind's regional project development win; Wisconsin Space Program's launch of the state's first liquid-propellant rocket; and Badger Solar Racing's first provisional American Solar Challenge qualification. Student initiative is also inspiring new teams, including Wisco Humanoids and Wisconsin Underwater Autonomous Vehicles, opening more avenues for teamwork and hands-on engineering.

The conversations at the Arboretum reinforced my confidence in our future and the people shaping it. Thank you to our alumni and partners for supporting our students, sharing your experience and helping us build on 150 years of Badger engineering.

On, Wisconsin!

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In memoriam

Emeritus Professor Bob Rowlands passed away on Sept. 5, 2026, at age 90. Rowlands joined the college in 1975 and became a full professor in 1979. During his distinguished academic career, he supervised 27 PhD students and 12 MS thesis students, authored or co-authored more than 200 technical publications, and served as director of the Wisconsin Structures and Materials Testing Laboratory from 1984 to 1990. He also received numerous international technical awards and was a fellow of several technical societies.



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On the cover: From left: PhD student Euigeol Jung, former postdoctoral fellow Yichao Shi and Professor James Pikul hold a robotic rover that's powered by their aluminum-air battery. Photo: Joel Hallberg.



New aerospace engineering major ready to soar

Sam Snyder came to the UW-Madison smitten with the city and campus and confident in his career aspirations: He hoped to work in the aerospace sector, preferably as part of efforts to introduce clean energy elements to the industry.

One hitch in his plan was that the university didn't offer a formal aerospace engineering major; instead, he could major in engineering mechanics with an aerospace option. Not a dealbreaker for him, but certainly not ideal.

Now, Snyder and the rest of the growing conglomeration of students interested in the aerospace industry can choose a major that fully matches their professional ambitions: The college launched an aerospace engineering undergraduate degree program in the ME department in the fall 2026 semester. It's the first such program in the state of Wisconsin.

"I'm super excited that everything's falling into place," says Snyder, a sophomore who grew up in Ohio before moving to Shorewood, Wisconsin, just north of Milwaukee, before his senior year of high school.

The new major is the result of a surge in student interest, along with demand for more workforce talent from industry, says Darryl Thelen, the John Bollinger Chair of Mechanical Engineering.

While the previous engineering mechanics major with the aerospace option (renamed from astronautics in 2020) typically drew 40 to 50 students a year, roughly 30% of mechanical engineering majors indicated in a 2024 department survey that they would major in aerospace engineering if they could. Mechanical engineering is by far the college's largest major, with nearly 1,600 students as of the spring 2026 semester.

With the process of creating the new major underway, the department told prospective students during 2024-25 campus visit days that those who started in engineering mechanics would be able to switch to aerospace once it formally launched. Thelen says the number of incoming engineering mechanics majors in 2025-26 increased by 60%. In fall 2026, 165 students enrolled in the aerospace engineering undergraduate degree program.

Work began behind the scenes in 2024, led by Associate Professor Jennifer Franck, William A. and Irene Ouweneel-Bascom Professor Gregory Nellis and Assistant Teaching Professor Arganthael Berson. After benchmarking top aerospace engineering programs from around the country and consulting ABET requirements, the program committee remodeled the previous iteration to include coursework in design and analysis, solid mechanics, dynamics and controls, energy systems and fluid mechanics, capped with two aerospace design courses.

"When you look at aerospace programs around the country, everyone has their own flavor or their own strength," says Franck, who created a new course for first-year students interested in aerospace in 2024. "One of the discussions we had was, 'What is our strength at Wisconsin?' And I think the answer to that is we grew out of an engineering mechanics program, so our strength is in mechanics: fluid mechanics, solid mechanics and dynamics. But also, we can leverage all the strengths we have in mechanical engineering, in design and fabrication, and giving the students access to these awesome clubs. I think the combination is really going to be a fabulous experience."

In addition to opportunities with student organizations such as the SAE Aero team (which builds small aircraft), Wisconsin Space Program (which is working toward building a liquid rocket) and a raft of robotics and automotive competition teams, students will get hands-on experience with the college's new educational wind tunnel and upgraded flight simulator.

Isabella Belgiorno, a sophomore from Grafton, Wisconsin, is already looking forward to using the simulator while taking a course in flight dynamics and control in a few years. "Just knowing that I'll get to actively participate with that in the future is really exciting," she says.

Undergraduate Sam Snyder, shown working with the wind tunnel, has worked as a teaching assistant for Introduction to Mechanics and Aerospace. Photo: Joel Hallberg.

FOCUS ON NEW FACULTY



Chloe Dedic joined the department as an associate professor in August 2026. Her research is focused on the development and application of advanced, laser-based measurements and optical sensors to study reacting gas-phase flows, such as combustion systems or the flow around high-speed aerospace vehicles. These types of environments are characterized by extremely high temperatures, reactive chemical species, a large range of pressures, and a large amount of spatial and temporal variability. It is challenging to accurately measure these types of reacting flows using traditional probe-based techniques or sensors. Instead, Dedic develops ways to use the interaction between light and molecules to quantify macroscale, "engineering" quantities like temperature or pressure within flows. In particular, she aims to make spatially-resolved, quantitative measurements of these thermodynamic properties that are accurate and reliable.

Dedic earned her BS and PhD degrees from Iowa State University in 2012 and 2017, respectively. After graduation she worked as a visiting scientist with the National Institute of Aerospace at NASA Langley Research Center and joined the University of Virginia Mechanical and Aerospace Engineering Department as an assistant professor in 2018. She is the recipient of a DARPA Young Faculty Award, a NASA Early Career Faculty Award and the AFOSR Young



Douglas Carter joined the department as an assistant professor in August 2026. He is an expert in turbulent flows and unsteady aerodynamics. His research encompasses all aspects of turbulent flows—from the "low" speeds typical of engineering and commercial aviation applications to "high" speeds found in challenging scenarios like atmospheric reentry of vehicles returning to the planet from space. His lab, the Experimental Turbulent Flows Lab (ETFL), develops and uses the latest in measurement diagnostic technologies to address state-of-the-art challenges from fundamental turbulence dynamics to applied aerothermodynamics. "I couldn't be more excited for the capabilities we are going to develop at UW-Madison, particularly in high-speed flows," he says. "There are so many aspects of turbulence in high-speed aerodynamics we still don't fully understand and the facilities we are building will address those challenges head-on."

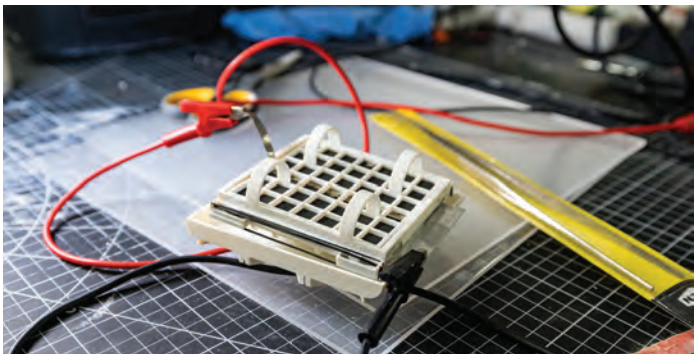
Carter earned his bachelor's degree in mechanical engineering from the University of New Hampshire in 2014 and his master's degree and PhD in aerospace engineering and mechanics from the University of Minnesota in 2017 and 2019, respectively. Prior to joining UW-Madison, he was an assistant professor at the Illinois Institute of Technology. He is a recipient of the 2026 Young Investigator Program award from the U.S. Air Force Office of Scientific Research.



Shaoting Lin joined the department as an assistant professor in August 2026. His research in the Extreme Soft Materials Laboratory has been focused on fundamental problems associated with the mechanical failures of soft materials and the longevity of soft machines. The research of his group—at the intersection of solid mechanics, polymer science and advanced manufacturing—aims to understand the processing-structure-property relationships of soft materials, thereby pushing the limit of mechanical and physical properties of soft materials.

His research group's mission is to leverage extreme soft materials for developing next-generation technologies, including in-situ hydrogel bioelectronics, physics-empowered tactile robots and high-precision sperm selection. Lin was hired through the university's RISE-THRIVE initiative and is seeking to use the move to UW-Madison to expand his work in the use of hydrogel bioelectronics for medical applications.

Lin earned his PhD degree at MIT in 2019 and completed his MS degree and BS degrees at Tsinghua University. He comes to UW-Madison from Michigan State University, where he was an assistant professor of mechanical engineering.



Aluminum-air battery cuts robot energy-storage mass by 41%

A robotic rover powered by a new aluminum-air battery completed the same 60-kilometer mission as a lithium-ion-powered rover while carrying 41% less total energy-storage mass. Developed by UW-Madison engineers James Pikul and Yichao Shi and reported in the journal Joule, the system can be mechanically refueled in under a minute by replacing a spent aluminum pouch with a fresh one.

The approach could help robots, construction equipment and other machines operate for longer periods in locations where electrical charging is slow, impractical or unavailable. Rather than functioning as a sealed battery that must be plugged in, the system operates more like a fuel cell: aluminum is supplied as fuel, while the same air cathode, hydrogel electrolyte and supporting hardware are reused.

"We designed this more like a fuel system than a conventional rechargeable battery," says Pikul, the Leon and Elizabeth Janssen Associate Professor. "When the aluminum is spent, you remove one pouch, insert another and keep working."

In a metal-air battery, the metal acts as the fuel, with ions flowing through an electrolyte between the metal and, at the other terminal, oxygen that's absorbed from the atmosphere.

In their design, Pikul and his team placed the aluminum slab in a pouch—essentially a tea bag—that prevents the byproduct of aluminum's oxidation reaction from contaminating the rest of the cell. Rather than using a liquid electrolyte—the typical option—the group used a hydrogel that gets replenished with small doses of water and potassium hydroxide. The whole setup sits inside a spring-loaded package that provides mechanical pressure to maintain contact at the interfaces while allowing for the expansion that occurs when aluminum oxidizes.

To keep the battery running, automated microdosing of the hydrogel electrolyte replaces the water consumed in the chemical reaction that occurs on the air terminal. And once all energy is extracted from one piece of aluminum, manually swapping in a fresh piece takes less than a minute. Eventually, a robot powered by such a battery could even autonomously "eat" aluminum to refuel.

The team's new aluminum-air battery. Eventually, a robot powered by such a battery could even autonomously "eat" aluminum to refuel. Photo: Joel Hallberg.

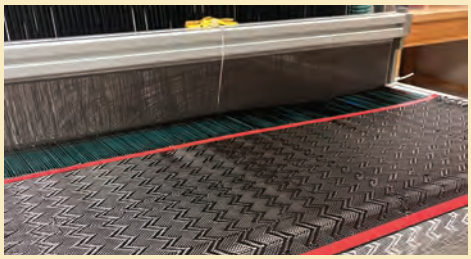
With a body-hugging fit, an innovative composite can thwart lightning damage to aircraft hulls

A team of UW-Madison engineers has designed a protective hybrid fiber-reinforced polymer composite "blanket" that could significantly reduce lightning strike damage and improve protective coverage for aircraft and other high-flying vehicles. The research published in the June 2026 issue of the journal Composites, Part B: Engineering.

Pavana Prabhakar, the Charles G. Salman Associate Professor of Civil and Environmental Engineering and Mechanical Engineering, says the material integrates metal "yarn" within the carbon fiber fabric and can be used as a fiber-reinforced polymer composite near the surface of a structure to distribute electrical charge away from a lightning strike site.

Modern aircraft bodies increasingly include carbon fiber-reinforced polymer composite components due to the material's high strength and light weight compared to their metal counterparts. "These composites are not very good at conducting electricity," Prabhakar says. "When lightning strikes these surfaces, it can cause quite a bit of damage because excessive heat builds up from poor electrical dissipation. Integrating the metal yarn within that layer provides a path for improved electrical dissipation and reduces that heat buildup and hence, can mitigate the associated damage."

Today's aircraft employ conventional expanded metallic foil lightning strike protection systems that can delaminate, or chip off, polymer composite layers when a strike occurs. However, that delamination can further damage the fuselage, and the structure can be difficult and expensive to repair. These metallic foils also struggle to conform



to complex shapes frequently found in emerging advanced air mobility vehicles such as air taxis. Prabhakar's research team decided to look for solutions to this challenge. Their solution is a drapable fabric, similar to a t-shirt or jacket, meaning it can more easily conform to complex geometries than traditional expanded foil systems.

The researchers used a loom to weave a metal "yarn" into a carbon fiber fabric. The resulting material can drape over airframes and better disperse the electric charge of a lightning strike than standard carbon fiber-reinforced polymer composite materials. Submitted photo.

With NSF CAREER award, Josh Roth is studying joint instability to enhance knee osteoarthritis treatments

For people with knee osteoarthritis, instability in the knee joint can limit function and accelerate the disease process.

In a healthy, stable joint, tissues such as ligaments and muscles hold the two bones of the joint together tightly enough to enable functional movement but not so tight as to limit range of motion. Ligaments are stiff tissues that passively guide and restrain joint motion, while muscles are active tissues that generate forces to drive joint motion.

However, the root cause of joint instability is not well understood.

"Understanding joint instability is a tricky problem because the ligaments and muscles work together to stabilize the joint, so if one of these tissues is deficient, it's possible that the other helps pick up the slack," says Josh Roth, an assistant professor in the departments of orthopedics and rehabilitation and mechanical engineering. "It's really difficult using existing techniques to be able to tease apart which structure—ligaments or muscles—is actually contributing to stabilize a joint, or which structure is actually deficient in someone who has an unstable joint."

To solve this challenge, Roth is using a National Science Foundation CAREER award to develop a device—an active knee exoskeleton—and a systematic method to tease apart the key contributions of ligaments and muscles to knee stability.

Roth's research could enable clinicians to create better personalized treatment plans for patients with knee osteoarthritis. For instance, if clinicians could identify that a patient's joint instability is due to a deficiency in their ligaments, then a surgical procedure would be the most effective treatment approach. On the other hand, if the muscle was deficient, then a non-operative, rehabilitation treatment would be the best approach.

"Many patients, especially those with severe osteoarthritis, will require both surgical treatment and rehabilitation, and figuring out how these two structures work together will help guide the surgery as well as the post-surgery rehabilitation to really help an individual patient get back to their activities," Roth says.



Assistant Professor Josh Roth works on his lab's state-of-the-art robotic testing system. Photo: Joel Hallberg.

Engineering teams receive SEED grants promoting technology transfer to industry





Joseph Andrews, Alfred Fritz Associate Professor in ME and ECE, and Eric Tervo, Dugald C. Jackson Assistant Professor in ECE and ME, have received annual State Economic Engagement & Development (SEED) funding.

The SEED Research Program funds are designated by the state legislature and administered by the Wisconsin Entrepreneurship Hub. SEED grants allow UW–Madison faculty and academic staff who are co-founders in a Wisconsin company to engage in innovative research, generate additional private and public sector support for their research programs, and promote technology transfer between the university and industry.

Andrews is principal investigator and Jinyi Huang, an associate professor of soil and environmental sciences, is co-principal investigator on a project with their company Saturn Soilsense. Their team has developed a patented inkjet-printed sensor technology that can continuously monitor nitrate concentrations in soil. This provides real-time data on nitrate levels, allowing farmers to apply fertilizer more strategically and reduce over-application. With SEED funding, the team will work to increase the longevity and reliability of the membranes used in this sensing technology.

Tervo and ECE Associate Professor Jennifer Choy are co-principal investigators on a SEED project led by Mikhail Kats, the Antoine-Bascom Professor and Jack St. Clair Kilby Professor in ECE. Their project is developing an alternative to satellite-based GPS, which is vulnerable to jamming and spoofing. They are investigating a new approach based on compound semiconductors to increase the sensitivity of nitrogen-vacancy magnetometers. Madison-based Dirac Labs, which is developing magnetic navigation systems, aims to use these enhanced sensors in the next generation of their navigation system.

STUDENT COMPETITION TEAMS



Badger Solar Racing reached an exciting milestone at the 2026 Formula Sun Grand Prix. For the first time in club history, the team qualified for the 2026 American Solar Challenge after proving its vehicle had what it takes. The team's second solar car, Sunburst, made its competition debut at the 2026 Electrek Formula Sun Grand Prix (FSGP) at Brainerd International Raceway in Minnesota. The event marked the culmination of more than three years of design, manufacturing, integration, testing and refinement by generations of students dedicated to bringing the team's newest vehicle to life. The team also finished 16th out of 35 teams in the single occupant vehicle class—an impressive result for Sunburst's first competitive outing. Although the team celebrated this historic achievement, an issue discovered during final preparations for the American Solar Challenge prevented the battery pack from charging reliably. After carefully evaluating the situation, Badger Solar Racing made the difficult decision to withdraw from the challenge.



Set against the red-rock landscape of southern Utah's desert terrain, Wisconsin Robotics debuted a newly designed competition rover at the 2026 University Rover Challenge (URC). After narrowly missing qualification the previous year, the team earned an impressive 12th-place finish among 38 finalist teams—and 116 teams worldwide—displaying the strong efforts and hard work of this 60-member organization. The team competed in a series of Mars-inspired missions that tested its rover's ability to navigate rugged terrain, conduct scientific investigations, service equipment and complete complex tasks that mirror those faced during planetary exploration.



At the end of the 2025 season, Wisconsin Aerospace (formerly known as SAE Aero UW) had two main goals: place higher at the competition and bring an even larger group of students to represent UW-Madison. With the 2026 season in the books, Wisconsin Aerospace accomplished these goals and more. The team placed 18th out of 31 teams (up from its 22nd placement out of 27 teams last year) and tripled its competition attendance. Unfortunately, the team encountered electrical issues that prevented it from earning a flight score. Despite this setback, the students came away with valuable lessons, ideas for improvement and plenty of motivation for next year's event.



The Wisconsin Baja team placed 21st overall in the June 2026 Baja SAE competition at Hogback Hill in Palmyra, New York. Among other events, the team competed with its disco-themed car Boombox in the endurance race, a 4-hour race through a 1.5-mile track filled with jumps, mud pits and obstacles. A failure an hour into the race with a lower control arm had the team breaking out the welder, but after the fix, its car was back on the track and competed for another 2.5 hours, ultimately making up over 20 places and finishing 23rd out of the 102 teams in the race.



Wisconsin Autonomous has closed the chapter on their AutoDrive II journey, finishing 3rd overall across the full five-year SAE AutoDrive II Challenge. In this multi-year competition, hosted by SAE International and GM, select schools work to transform a Chevrolet Bolt into an autonomous vehicle. The team is now excited to transition to the EcoCAR Innovation Challenge. "AutoDrive naturally pushed us to be a more software-oriented team, but EcoCAR brings a new challenge," says Keshav Sharan, the team's technical director. "As we move into this next phase, mechanical and electrical engineering skills will be more central to the team's success.



After two years of fast paced development, WISP, the Wisconsin Space Program student org, competed at the FAR-OUT competition in Mojave, California, with the first liquid rocket in UW-Madison and Wisconsin state history. The rocket – standing at 13.5 feet from tip to tail and 8 inches in diameter – was powered by isopropyl alcohol and a liquid oxygen system. As the only team using a liquid oxygen system, the Badger engineers found success in designing an incredibly, energy-dense engine. The students' design and dedication landed the team a first-place finish in Category B – the grouping of teams with the ability to reach 20,000-50,000 feet in altitude.

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Student receives National Defense Science and Engineering Graduate Fellowship

PhD student Lucas Derbyshire has been awarded the 2026 National Defense Science and Engineering Graduate (NDSEG) Fellowship. This award is sponsored by the Air Force Office of Scientific Research, the Army Research Office and the Office of Naval Research.



Submitted photo

Derbyshire was chosen from a pool of 5,615 applicants this year for his outstanding achievements in STEM. His PhD research investigates how weave architecture and material hybridization influence the damage tolerance and long-term durability of woven composites, which are materials essential to modern high-performance structures. It represents a deep dive into understanding the foundational mechanics of woven composites in multi-physics environments, where mechanical loading, environmental exposure and chemical interactions occur simultaneously. Through integrated mechanical testing, environmental conditioning, chemical characterization and computational modeling, this research examines how these materials respond to the combined environmental and mechanical stresses encountered in real-world service conditions.

His work aims to generate fundamental insights that enable the design of lighter, more durable composite structures with enhanced performance and extended service lives. By advancing understanding of composite behavior under realistic operating conditions, Derbyshire's research supports broader efforts to reduce energy consumption, minimize material waste and decrease maintenance requirements across aerospace, automotive, renewable energy and other advanced engineering sectors.

Pavana Prabhakar, Charles G. Salmon Associate Professor in civil and environmental and mechanical engineering advises Derbyshire. "As Lucas's mentor, I am truly delighted and excited to celebrate his receipt of this prestigious fellowship for his doctoral research in composite materials," Prabhakar says. "It has been a pleasure to watch his growth as a researcher, and this achievement is a wonderful reflection of his hard work, talent, and dedication. I have no doubt that, with this support, Lucas will continue to make important contributions to the field and help advance next-generation structural materials with real impact."