

# THE UW SPACE ENGINEERING & EXPLORATION PROGRAM:

INVESTING IN THE FUTURE OF AERONAUTICS  
& ASTRONAUTICS EDUCATION AND RESEARCH

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COLLEGE OF ENGINEERING  
UNIVERSITY *of* WASHINGTON



Since the dawn of humankind, space has captured our imagination, and knowledge of the stars has influenced our ambitions. In the modern era, interplanetary exploration has dramatically increased our understanding of the universe and led to technologies that enhance life on earth. At the University of Washington's William E. Boeing Department of Aeronautics & Astronautics, we are transforming aeronautics and astronautics education to ask the biggest questions, to examine the smallest details, and to prepare students for the increasingly expansive aerospace industry of the future.

Through an innovative, interdisciplinary curriculum, our department is testing the outer limits of material performance and structural design while re-imagining advanced rocket propulsion and commercial space launch. Aided by algorithms and dynamic control systems, enterprising students use autonomous vehicles to navigate new worlds and gain access to terrain only robots can reach.

Here in Seattle, we are surrounded by the highest density of aerospace industry in the nation and our academic excellence is bolstered by hands-on partnerships with pioneering companies at the leading edge of NewSpace.

Department Chair Anthony Waas brings energy and vision to his role. His passion for computational aerosciences and advanced aerospace design and manufacturing methodologies of the future has ignited a groundswell of support among students and faculty alike. Building on a century of expertise in aerospace education and leading-edge research (see "Research Excellence," page 10), UW A&A is ideally positioned to advance a groundbreaking space program that seizes this moment and looks ahead to the next 100 years. We invite your investment in this exciting endeavor.



### Meet the Chair

As an internationally recognized expert in lightweight composite aerostructures, with a focus on automated manufacturability, structural integrity and damage tolerance, mechanics of textile composites, stitched composites and 3D composites, department chair and Boeing-Egtvedt Endowed Chair Anthony Waas is uniquely qualified to lead the development of a new curriculum centered on advanced manufacturing and automation.

Dr. Waas joined the UW in January 2015 from the University of Michigan, where he rose through the faculty ranks, ultimately being honored with the Stephen S. Attwood Excellence in Engineering Award — the highest honor for a faculty member in the University of Michigan's College of Engineering.

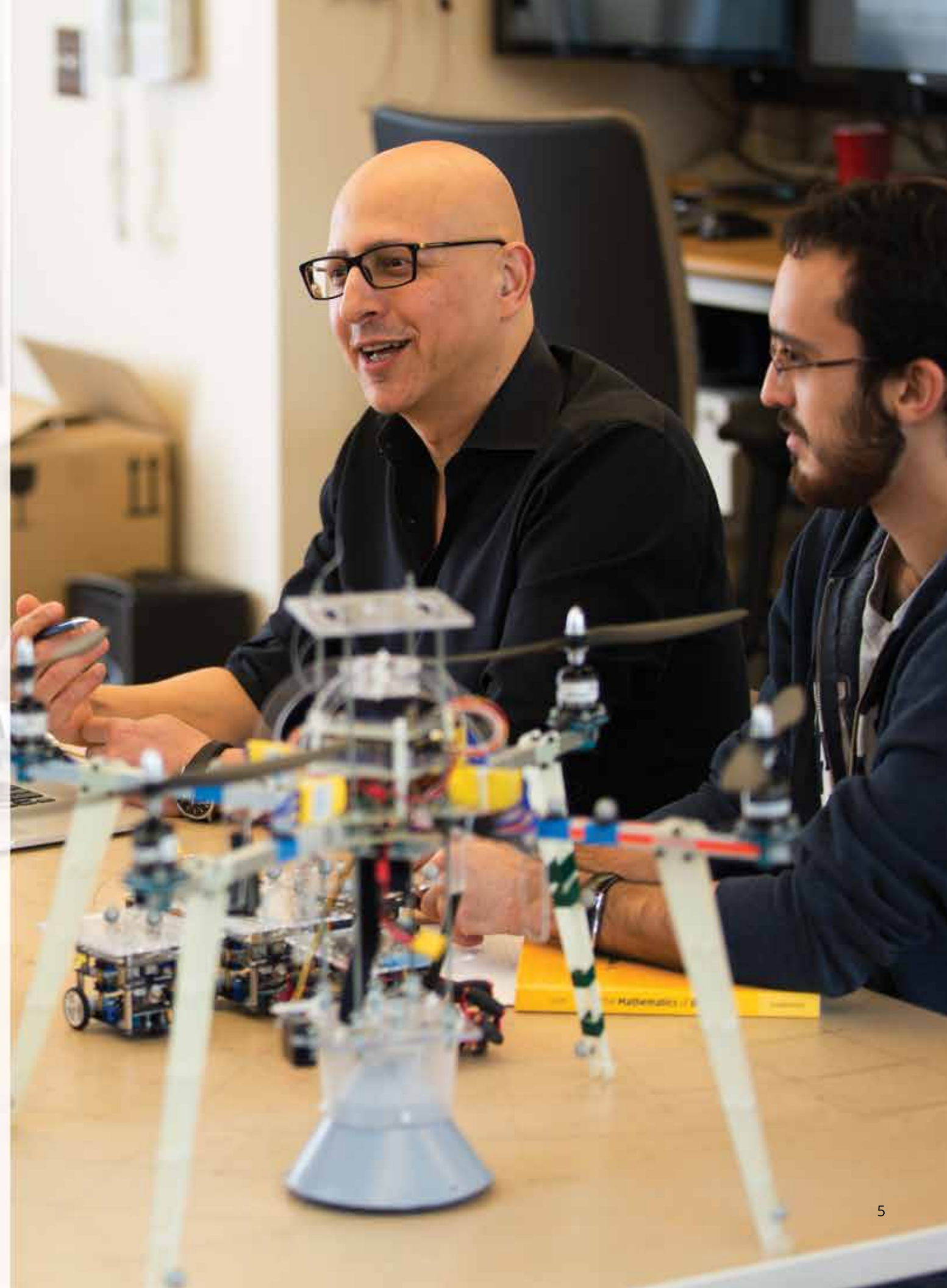


## William E. Boeing Department of Aeronautics & Astronautics: The Next 100 Years

The history of air and space flight is filled with contributions from our faculty and students, and our graduates find employment throughout the aerospace industry. Today, a century after the Boeing Wind Tunnel (now the Aerodynamics Laboratory) was built, we still offer the only aerospace degree program in the Pacific Northwest. UW A&A is home to innovative, multi-disciplinary research in the following programs:

- **The Autonomous Flight Systems Laboratory**, which allows students to experience realistic guidance, navigation and control systems;
- **The Robotics, Aerospace, and Information Networks (RAIN) Laboratory**, home to research in single and distributed systems, networked systems and optimization and control;
- **The Autonomous Control Laboratory**, where students and faculty work on Guidance, Navigation, and Control (GN&C) for formation-flying spacecraft, proximity operations around asteroids and comets, and planetary landing algorithms;
- **The Advanced Dynamics, Validation & Control Research Laboratory**, housing a “plug-n-play” satellite simulator enabling testing and verification of spacecraft subsystems;
- **The Microgravity Science Laboratory**, pursuing the study of physical phenomena in which the normal force of gravity on earth is greatly reduced by the use of parabolic-trajectory aircraft, drop towers, sounding rockets, and by conducting experiments in space;
- **The Plasma Dynamics Laboratory**, which aims to discover and develop fundamental and integrated science among materials science, electric propulsion, and electro energetic physics that advances future space power and propulsion concepts based on high-energy-density plasmas;
- **The ZaP Z-Pinch Laboratory**, a confined high-density plasma experiment with potential to achieve very high propellant exhaust velocities in space, extending a satellite’s time in orbit;
- **The Collaborative Center for Advanced Manufacturing**, an industry-led forum addressing the future use and certification of robotically produced advanced composite structures, additive manufacturing for aerospace structures, and design for automation in aerospace.

Our faculty and students are collaborating across departments and schools to take space exploration to the next level; our goal now is to leverage both internal and external resources to create the top-ranked aerospace research and education program in the nation.



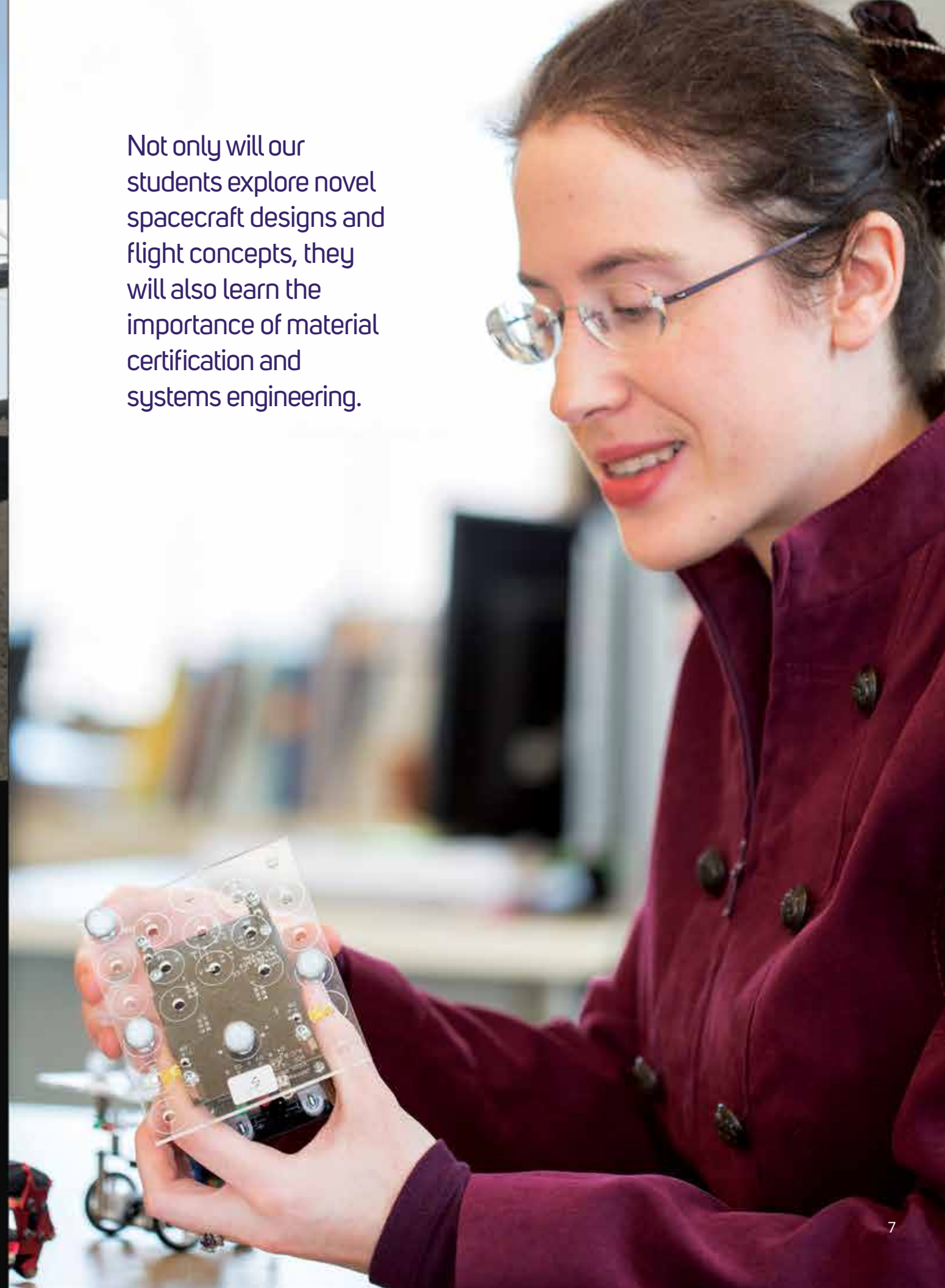


## Our Vision: A Bold, Modern Curriculum in World-Class Facilities

Our vision is of a new educational paradigm, with a boldly redesigned curriculum taught in state-of-the-art facilities. Aerospace engineering is rapidly changing with the adoption of additive design (3D Printing) and automated robotics. It is increasingly important for A&A students to understand the range of manufacturing methodologies available to them as they design for manufacturability and optimize for future production.

The **UW Space Research & Exploration Program** will enhance students' academic experience through hands-on projects, real-world challenges, active industry partnerships and interdisciplinary collaboration with other departments. Not only will our students explore novel spacecraft designs and flight concepts, they will also learn the importance of material certification and systems engineering. In this environment, students will gain business acumen and technical aptitude as they learn critical professional skills such as communication, project management and leadership. A program of this significance will also enable the UW to take a leadership role in policy development concerning the responsible use of aerospace technology.

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To realize the vision of becoming the premier higher education program in space engineering and exploration, while maintaining our established prominence in aerospace education, UW A&A must:

- Recruit and retain faculty members who are interdisciplinary experts (i.e., robotics experts with an interest in space), including faculty from industry;
- Build or renovate facilities to enable hands-on, collaborative learning experiences for an increasing number of students;
- Support student team projects and the highly successful, new capstone design program in a sustainable way; and
- Provide students access to the most advanced computational software to prepare them for professions in industry.



## Research Excellence

Our award-winning faculty members are leaders in their respective fields, conducting innovative multi-disciplinary research in collaboration with students. Examples of these faculty and their work include:

- Professor and Associate Chair for Academics Kristi Morgansen researches methods for integrated sensing and motion control in bioinspired and biological systems, control with communication constraints, and integrated human and autonomous multivehicle systems.
- Professor Mehran Mesbahi directs the RAIN lab, which focuses on the analysis and synthesis of networked distributed autonomous systems operating in complex environments.
- Professor and Associate Chair for Research Uri Shumlak researches plasma physics, theoretical & computational plasma modeling, innovative magnetic plasma confinement for fusion energy, and electric propulsion.
- Associate Professor Behçet Açıkmeye researches spacecraft control and technology systems; he has developed algorithms to improve the precision of future planetary landing missions and technology to enable asteroid mining.
- Assistant Professor Anshu Narang-Siddarth researches aspects of dynamic modeling, control and safety assurance problems unique to autonomous aerospace vehicles.

## Join Us

Private investment is critical to maintaining our current educational excellence while ensuring the UW Space Research & Exploration Program is achievable, sustainable and effective.

Opportunities for impactful investment include the following:

- Professorships to recruit and retain faculty in multi-disciplinary fields;
- Research acceleration funds to support faculty research and student projects;
- Capstone support to provide undergraduates with hands-on learning experiences; and
- Support for facilities construction and renovation.

For more information about the UW Space Research & Exploration Program, or about UW A&A, please contact Katie Frisbie Bunten, associate director for advancement, UW Engineering Advancement, at (206) 616-8310 or [frisb@uw.edu](mailto:frisb@uw.edu). Thank you for your interest in UW A&A.

**BE BOUNDLESS**  
FOR WASHINGTON

FOR THE WORLD