



Department of Aerospace Engineering





PREAMBLE

The Department of Aerospace Engineering at Penn State is an international leader in aerospace education, research, and engagement. Its undergraduate and graduate programs are ranked 11th and 14th respectively, according to *U.S. News and World Report*; higher-ranked departments are larger. The Department is in the top five in terms of B.S. degrees (despite an enrollment cap) and in the top 10 in terms of M.S. and Ph.D. degrees, even with a faculty size only in the top 15. In 2011 and 2013, *Aviation Week & Space Technology* named Penn State as the #1 university from which the aerospace and defense industry prefers to hire engineers. And about 1 in 25 holders of a degree in aerospace engineering earned it from Penn State, further evidence of impact.

While rightly proud of its accomplishments, the Department is determined to strengthen and broaden its educational programs, modernize its research portfolio, expand the faculty in emerging areas, and focus on societal impact. The Department will emphasize the pursuit of new opportunities for education and research that address global challenges and align with University priorities.



VALUES

Excellence

We live in an evermore competitive world, and many important challenges that face humanity require dedicated, effective research, and education. We must set high standards and demand excellence from ourselves and from our students; our collective success and reputation depend on it.

Innovation

We seek and embrace innovation in learning, discovery, invention, and governance. Our best hope for sustaining a high-wage economy in a sea of low-wage workers is through relentless innovation and commercialization.

Professionalism

We conduct all our tasks ethically and with integrity, exercising good judgment, sharing information, and respecting others. Students should have opportunities to be involved in practical hands-on team projects, perhaps industry-driven, as part of their education. They should come to appreciate the global nature of engineering and commerce, through experiences that may, but need not necessarily, involve travel. And we should promote character development by providing students opportunities to practice leadership, societal service, and ethical behavior both inside and outside of the university environment. We strive to graduate “engaged engineers.”

Integrity

We respect others, conduct ourselves ethically, honesty and openly, honor our commitments, and fairly resolve ethical issues.

Diversity

Solutions to the problems we address benefit from having people with diverse viewpoints and experiences. We seek to provide a welcoming environment for demographically and intellectually diverse people. Because equal opportunity is an ideal aspiration not experienced uniformly in real life, we must work to ensure that people from underrepresented groups have opportunities and the support needed to succeed.



Collaboration

We collaborate across disciplinary boundaries to attract and integrate expertise and experiences complementary to ours. Intertwined issues involving population, food, water, energy, climate, the environment, health, education, security, economic development (including manufacturing and information), urbanization, governance (in a multipolar world), and conflict will be at the forefront of societal and engineering challenges for the next 30 years. Addressing such discipline-bridging issues will require close interaction and partnerships with researchers in other fields, as well as with policy makers.

Sustainability

We strive to protect and enhance our natural and built environment for future generations.

VISION

Our vision is to be a national and world leader in aerospace education and research, combining an innovative curriculum and instruction that reflects current practice and future trends; research that has a significant impact on society; and professional excellence as we lead aerospace engineering in air, space, sea, and land. Through our own work, and especially through the lives of our graduates, we strive to make the world a better place.

MISSION

Our mission is three-fold: education of the next generation of aerospace engineers and researchers for professional practice and leadership; research and development of next-generation technologies and systems; and service to the University, the profession, and society.

Future generations of aerospace engineering graduates will find themselves competing with peers globally. To compete successfully, our graduates will not only need to have deep technical knowledge in the core disciplines and integrative systems aspects of aerospace engineering, but will have to be capable of innovative engineering thinking. Many of the technologies our students will work on in their careers do not exist today, so we must instill in them the importance of life-long learning to take our profession into the future.



STRATEGIC OBJECTIVES



Education

Develop innovative residence and distance programs for undergraduate and graduate aerospace students that respond to current and emerging global needs of society, including industry, government and academe. Our graduates will have outsized impacts as excellent engineers and leaders.



Research

Advocate for and undertake aerospace research that addresses pressing global challenges, serves society, and contributes to economic development. This research addresses exploration, infrastructure (transportation, observation, communications), defense, energy, and environmental sustainability.



Service

Our faculty and graduates contribute to and provide leadership in aerospace and educational professional organizations. They are recognized as stewards of economic prosperity, innovation, and social responsibility; and serve as role models for our students.



Institutional Governance

Create and evolve organizations and processes that balance agility and flexibility with consultation and due process to achieve effective pursuit of Departmental objectives with financial stability and a sense of shared purpose.



STRATEGIC GOALS



In Education

We will continue to emphasize hands-on student team projects, including ethics and communication skills, while exploring ways to address high demand and enrollments in our major. Strategic goals in education include: i) raising the quality and profile of our graduate program to match or exceed that of our undergraduate program; ii) improving our undergraduate program by adding emphasis on “engineering thinking;” and iii) expanding relationships with peer institutions abroad.

These goals will be achieved by taking the following actions:

1. Introducing a one-year residence Master’s degree program in aerospace engineering, and developing new graduate-level courses consistent with tuition income from unfunded students and faculty teaching capacity that is not directed at the undergraduate program.
2. Attracting highly qualified graduate students to our program through fellowships, competitive assistantship offers, and outreach.
3. Developing an introductory sophomore-level course and a junior-level course on engineering problem solving. To serve students at the campuses, the first course could be taught both online and in residence. The second could be tightly coupled with AERSP 309 and AERSP 306 and follow a studio format. We also need to develop a design studio space to support student design teams. A like number of credits in the junior year might need to be restructured.
4. Developing real exchange programs with select peer institutions in the U.K., Europe, and Asia.
5. Expanding our online wind energy graduate offerings.



In Research

Requiring deep knowledge of fields including (but not limited to) aerodynamics, structures, dynamics, controls, propulsion, and computing, aerospace engineering is inherently interdisciplinary. We will further broaden the transdisciplinary scope of our activities while we continue to contribute to our core fields. Strategic goals in research include: i) increasing participation and leadership of large multi-investigator research programs; ii) assuring continued strength in vertical lift, aeroacoustics, and (sensory) adaptive structures for resilient infrastructure; iii) enhancing core expertise in aerospace flight dynamics and controls and autonomous systems such as UAS and space systems; iv) further developing core expertise in energy, transportation, and observation systems; and v) broadening our research scope to include cyberscience, complex systems, and advanced materials and manufacturing.

These goals will be achieved by taking the following actions:

6. Growing the faculty size to 24 will require pursuing faculty co-hires through collaboration with various Penn State institutes, as well as revenue streams for salaries and start-up funds.
7. Hiring new faculty members whose research interests include complex systems, autonomous systems, micro-systems and sensors, and flight and space vehicles. Attention will be given to diversity in the selection process and searches will be conducted at a broad level using interdisciplinary search committees.
8. Encouraging faculty to participate in proposals for large research programs such as MURIs by providing release time and travel funds. Leverage the College of Engineering innovation grant program.
9. Encouraging faculty members to develop research collaborations with faculty members in other departments, centers, and institutes as well as at other institutions.
10. Upgrading laboratories and equipment to facilitate new research programs.



In Service

Our faculty members already take on significant leadership roles in the technical community, serving as (associate) editors of journals, conference chairs, and officers of technical societies. We will focus on: i) increasing our influence and visibility by strategically targeting service opportunities; ii) helping junior faculty members take on leadership roles; and iii) increasing our Department's profile through service on national advisory panels.

The following actions support our service strategic goals:

11. Encouraging faculty members to seek nominations for (associate) editor positions at key aerospace journals.
12. Encouraging our faculty members to join technical committees of our professional societies, and to consider conference and society leadership opportunities.
13. Encouraging our faculty to serve on proposal review panels for federal funding agencies.
14. Assisting our faculty members in receiving nominations to national advisory panels.
15. Encouraging faculty members, staff, and students to seek opportunities for service leadership at Penn State.



In Governance

Strategic goals in institutional governance help to create organizational structures and management procedures that combine due process, achieve efficiency and agility to respond to ever-changing operational conditions, promote fiscal responsibility, ensure financial stability, encourage shared governance, further the careers of the staff, and enhance the sense of community and investment.

These goals will be achieved by taking the following actions:

16. Improving our marketing and outreach on all fronts.
17. Continuing to support the professional development of junior faculty members through mentoring on research and graduate advising, as well as on teaching development.
18. Establishing a women in aerospace engineering student organization, led by faculty and graduate students and including undergraduate students. Also establish a Penn State Aerospace Engineering Alumni Society. A key requirement is local alumni leadership. Develop an alumni mentoring program to assist students with the transition to the workplace.
19. Providing additional opportunities for staff development, including travel and registration fees. Address policies that make it difficult to promote internal staff.
20. Improving the Department's financial operation by considering commitments in terms of cash flow over time. Also streamline the graduate admissions process to make RA offers earlier.

The above 20 actions for advancing the Department in education, research, governance, and service form the basis of the implementation plan that will be developed in the next phase of strategic planning.