UNIVERSITY of WASHINGTON

WILLIAM E. BOEING DEPARTMENT OF AERONAUTICS & ASTRONAUTICS

From the development of advanced autonomous vehicles and systems to new aerodynamic techniques, novel space propulsion concepts and lightweight aerostructures and materials, the faculty and students of the William E. Boeing Department of Aeronautics & Astronautics are shaping the technologies that will drive air and space flight in the 21st century.

OUR MISSION

LAUNCHING CAREERS

Educating tomorrow's aerospace leaders is our highest priority. Our graduates find employment throughout the aerospace industry. From The Boeing Company to NASA, our alumni pursue successful careers in diverse sectors of the economy.

HARNESSING THE POWER OF INVENTION

Our students and faculty push the boundaries of air and space flight every day. From exploring the mechanics of biological flight to testing new designs for more durable, lightweight structures, research in our department is opening doors to cutting-edge technology that will define the future of air and space travel. Our faculty members are leaders in education, economic development and industry collaboration, and our students routinely show themselves to be the future leaders in both industry and academia—making our department and the University of Washington proud.

CROSSING BOUNDARIES

The history of air and space flight is filled with contributions from our faculty and students. Established as a department in 1929 and offering instructional classes in aeronautics as early as 1918, the William E. Boeing Department of Aeronautics & Astronautics was one of the first of its kind in the nation. Interdisciplinary work is the key to our department's continued growth.

STUDENTS

UNDERGRADUATE EDUCATION

202 currently enrolled

72 BSAAE degrees awarded in 2016-2017

10%
Underrepresented Minorities

20%
Female Students

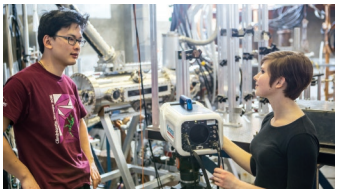
PROGRAM FEATURES

- Strength in core fundamentals
- Knowledge integration and application through hands-on laboratory experience and world-class senior design capstone
- Real-world focus on teamwork, communication and problem solving, systems analysis, interdisciplinary collaboration, leadership, and creativity

GRADUATE EDUCATION

231 currently enrolled

83 graduate degrees awarded in 2016-2017 (39 MAE, 39 MSAA, 5 PhD)



14%
Underrepresented Minorities

17%
Female Students

PROGRAM FEATURES

- Graduate concentrations available in: controls, fluids, propulsion, plasma, power, structures and composites
- Thesis and dissertation research opportunities for cutting-edge, interdisciplinary work
- Available research and teaching assistantships, supplementary stipends

DEGREE PROGRAMS

Bachelor of Science (BSAAE) - prepares students for graduate work or careers in the aerospace industry

Master of Science (MSAA) - research-oriented program prepares students for careers in industry and government, or for further graduate studies toward a Ph.D.

Master of Aerospace Engineering (MAE) - multidisciplinary, professionally oriented part-time degree program prepares students for advanced careers in industry

Doctor of Philosophy (PhD) - trains engineers for research leadership roles in academia, industry, and research institutions

STUDENT EXCELLENCE

- Air Force Research Laboratory Space Scholar
- Achievement Rewards for College Scientists Fellow
- Clean Energy Institute Graduate Fellow
- College of Engineering Dean's Fellows
- Department of Defense SMART Scholar
- Josephine de Karman Fellow
- Lemelson-MIT student prize
- Member of first class of UW Husky 100
- National Defense Science and Engineering Graduate Fellow
- National Science Foundation Graduate Research Fellows
- National Sciences and Engineering Research Council of Canada Fellows

FACULTY

COMPOSITION

15 core faculty

7 adjunct faculty

24 affiliate faculty

11 post-doctoral research associates

EXCELLENCE

- More than $6.5M in Research Awards in 2016-2017
- Executive Director: Washington State Joint Center for Aerospace Technology Innovation (JCATI)
- President: University Fusion Association
- Editor-in-Chief: AIAA Journal of Aircraft
- Professorship in Control Systems and Networks
- Multiple Early Career Awards from NSF and Department of Energy
- Member, Washington State Academy of Sciences

RESEARCH AND INNOVATION

TECHNOLOGICAL CONTRIBUTIONS

- **Autonomous Control Laboratory** – Research in advanced guidance, navigation, and control (GN&C), which combines advanced mathematical and computational methods to enable new autonomous vehicle systems, including space robotics, with integration into the department's flight mechanics and controls courses, providing students with the experience of realistic GN&C systems.
- **Composite Aerostructures** – Pioneering research in aerospace applications concerning smart materials and structures, structural health monitoring, damage tolerance and durability of composite structures, computational modeling of progressive damage and failure of composite structures, structural stability, aerothermoelasticity, multi-disciplinary optimization and nano-composites.
- **Fluid Dynamics** – Innovations, such as development of novel 2D and 3D velocimetry methods, complex fluid flow diagnostics, and shock-induced cooling in supersonic jets have contributed to discoveries in the areas of vortex dynamics, turbulent mixing, computational fluid dynamics and combustion.
- **Hypersonics** – High enthalpy laboratory provides Mach 7 steam flow at 0.4kg/s, hypersonic shock tunnel has Mach 7 nozzle.
- **Plasma Science and Space Propulsion** – Experimental and computational research on plasma science and controlled fusion, with particular emphasis on advanced alternative fusion concepts with applications in advanced propulsion.

AREAS OF IMPACT

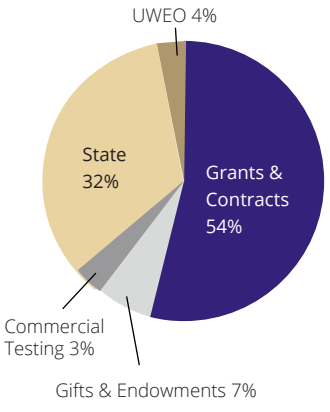
- Guidance and control systems
- Advanced composite materials and structures
- Aerodynamics and fluid mechanics
- Computational fluid dynamics
- Combustion and hypervelocity accelerators
- Microgravity science
- Autonomous vehicles and systems
- Space and terrestrial energy systems
- Plasma dynamics and space propulsion
- Air breathing propulsion
- Multidisciplinary design optimization
- Flight systems integration
- Damage and failure theories for composites
- Aeronautical design and testing
- Hypersonics

MAJOR FACILITIES

- **Kirsten Wind Tunnel** – A world-renowned subsonic facility with an 8-foot by 12-foot test section that produces highly accurate results.
- **Computational Fluid Mechanics Laboratory** – Fundamental research in single- and multi-phase as well as multi-species turbulent flows, with applications to internal and external aerodynamics and propulsion.
- **Autonomous Control Laboratory** – Research in advanced guidance, navigation and control (GN&C), which combines advanced mathematical and computational methods to enable new autonomous vehicle systems, including space robotics, with integration into the department's flight mechanics and controls courses, providing students with the experience of realistic GN&C systems.
- **Plasma Science and Innovation (PSI) Center** – Provides theoretical support for plasma research including extended magnetohydrodynamic (MHD) numerical codes to predict capabilities for fusion power experiments.
- **Robotics, Aerospace, and Information Networks (RAIN) Laboratory** – Multi-faceted research in the areas of guidance, control and estimation for single and distributed systems; theoretical underpinnings of networked systems; and optimization and control.
- **Nonlinear Dynamics and Control Laboratory** – Research focuses on nonlinear, single and multi-vehicle autonomous systems, with particular focus on bio-inspired, underwater and air vehicles.
- **Composite Structures Laboratory** – Fundamental research on the progressive damage and failure of advanced composite aerostructures including the characterization of high rate response, multi-axial load states and blast response.
- **Laboratory of Engineering Materials and Structures (LEMS)** – Design and development of advanced engineered structures through the creation of novel materials systems (e.g., metamaterials and phononic crystals) that offer additional degrees of freedom in controlling their dynamic responses.

ANNUAL OPERATING BUDGET FY17 ($16.4M)

SOURCE	AMOUNT
Grants & Contracts	8,796,245
Gifts & Endowments	1,201,483
Commercial Testing	499,942
State	5,316,530
UWEO	612,063
TOTAL	**$16,426,263**



RECENT A&A DISTINGUISHED ALUMNUS HONOREES

Dennis A. Muilenburg (M.S. 1990) is president and chief executive officer of The Boeing Company. Muilenburg joined Boeing in 1985, previously serving as president and chief executive officer of Boeing Defense, Space & Security. Prior to this, he held a progression of program management and engineering positions on a broad range of large-scale programs, including JAST/ASTOVL, F-22, AFX, EX surveillance platform, 747 Airborne Laser, Advanced Tactical Fighter, High Speed Civil Transport, and the Condor reconnaissance aircraft. He also is a fellow of the American Institute of Aeronautics and Astronautics (AIAA) and a fellow of the Royal Aeronautical Society.

Gregory C. Johnson (B.S. 1977) attended the U.S. Air Force Test Pilot School after graduating from UW A&A. In 1990, Johnson accepted a position as an aerospace engineer and research pilot with NASA's Johnson Space Center Aircraft Operations division. Johnson was selected by NASA as an astronaut in June 1998. He served as the pilot for the final space shuttle mission to the Hubble Space Telescope in 2009. Johnson is currently a management astronaut assigned as the acting chief, Aircraft Operations and is a qualified T-38 instructor pilot, T-38 examiner pilot, T-38 functional check flight pilot, WB-57F high altitude research pilot and KC-97 Super Guppy instructor pilot.

Heather Ross (B.S. 1985) has spent her career in the aviation industry as an engineer, military transport pilot, commercial airline pilot, customer demonstration pilot, engineering test pilot, speaker, mentor and educator. After graduation, Ross joined Boeing where she worked as a flight test engineer. She left after three years to join the U.S. Air Force and went on to fly the C-5 military transport airplane during Operation Desert Shield and Desert Storm. She later flew for United Airlines as a first officer on the 737 and 747 airplanes before returning to Boeing as a production pilot and was selected as a Boeing Associate Technical Fellow.

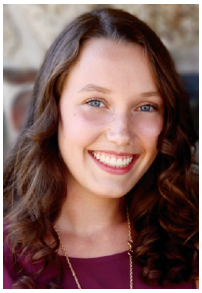
Lars Andersen (B.S. 1968) began his career at Boeing in 1973 where he worked on the 7X7, 707/CFM-56 re-engine, 757, and the 7J7 programs, and received a U.S. patent for a noise-suppression engine exhaust mixer. In 1989, Andersen joined the 777 program as chief engineer for the Extended Range Twin Operations (ETOPS). In 2000, he became vice president of the 777 program. After retiring in 2007, he was called back to serve as the vice president of 777 Product Development, where he works closely with the CEO. He is an active participant on the Boeing Senior Advisory Group.

A&A STUDENTS IN THE SPOTLIGHT

Osazonamen Igbinosun entered the Ph.D. program in 2013, earning an M.S. in Aeronautics & Astronautics in 2015. She also received an M.S. in Earth and Space Sciences with a focus in planetary science in 2013 from the UW, and a B.S. in physics and astronomy from University of Rochester. Igbinosun served as a U.S. Naval Aviator, is a National Science Foundation Fellow, and is the recipient of the 2016 Society of Women Engineers Region J Scholarship.

Derek Sutherland is a Ph.D. student in plasma physics and fusion energy, working in the steady inductive helicity injected torus (HIT-SI) research group. Sutherland joined A&A in 2012 after completing his B.S. in nuclear science and engineering and physics from MIT. He plans to develop fusion energy into a feasible energy source and fossil fuel alternative. He was recently named as one of Forbes Magazine's "30 under 30" for his contributions to energy research.

Navdeep Sandhu received his B.S. in 2016. As a senior, he was the UW AIAA student chapter outreach coordinator, worked in our Ram and Shockwave labs, interned with the Boeing Flight Test Instrumentation group and was the recipient of the Dale & Marjorie Myers Scholarship. Sandhu is now enrolled in our Master of Science degree program, and is researching the effects of ice accretions on subsonic swept wings. He has also partnered with local startups to explore urban wind turbines to harvest renewable wind energy and bring these products to market.



Alexis Harroun graduated in 2017 with a B.S. While at the UW, she was the propulsion technical lead for the Society for Advanced Rocket Propulsion and the senior class president for the UW AIAA student chapter. Harroun worked on the design and testing of chemical propulsion systems while interning at Blue Origin and volunteering in the Ram Accelerator Lab. She received the Robert Max Reynolds Endowed Scholarship, College of Engineering Dean's Medal for Academic Excellence and currently studies rocket propulsion at Purdue University thanks to a NASA Space Technology Research Fellowship.