Aerospace Engineering Update

Dr. Brian Thurow
Department Chair
thurow@auburn.edu
(334) 844-6827

AE Day in Huntsville
Friday, March 1, 2019
Auburn University 2019-2024 Strategic Plan

- Elevated Auburn Experience
- **Transformative Research**
- Impactful Service
- **Exceptional and Engaged Faculty and Staff**
- Strategic Enrollment
- Operational Excellence
The best student-centered experience in America

Leading research that improves the quality of life and fosters economic competitiveness

A dynamic faculty that exemplifies excellence and innovation
Aerospace Engineering

Fall 2018 Enrollment
- Undergraduate: 488
- Graduate: 51 (Goal: 100)

Degrees
- B.S.
- M.S.
- Ph.D.

Curriculum
- Aerodynamics & Propulsion
- Aerospace Structures & Materials
- Flight Dynamics and Control
- Orbital Mechanics
- Aerospace Design
Undergraduate Enrollment

- Fall 2018 - AE
  - 488 undergraduate students
  - 40% growth in 4 years
- Fall 2018 - College
  - 5,559 undergraduate students
  - 20% growth in 4 years
- Auburn University
  - 25,734 undergraduate students
  - 20% growth in 4 years
- AE growing at a faster rate than the college or university
Undergraduate Program Highlights

- **Student Projects**
  - AIAA Design, Build & Fly
  - NASA University Student Launch Initiative
  - Spaceport America Cup
  - AU Small Satellite Program

- **AIAA**
- **AUVSI**
- Undergraduate Research
- Co-Ops & Internships
Recent Faculty Departures

Cochran
Foster
Crouse
Shelton

Sinclair
Gross
Cicci
Current Faculty

13 Tenure-Track Faculty (9 hired in last 3 yrs)
3 Lecturers
4 Staff

1 Open rank position in dynamics and controls

+1 Senior faculty hire
Recent Faculty Highlights

- Dr. Imon Chakraborty and Dr. Roy Hartfield
  - NASA grant ($540k over 3 years)
  - *Modular Generalized Framework for Assessing Aircraft Aero-Propulsive, Stability, and Control Characteristics*

- Dr. Vrishank Raghav
  - ARO Grant ($463k over 3 years)
  - *Study of Flow Separation on a Rotating Wing Using Volumetric Velocimetry in the Rotating Frame of Reference*

- Dr. Toshi Hirabayashi
  - Pending NASA grant ($280k over 3 years)
  - *Geophysical Approach for Quantifying the Relationship between the YORP Effect Evolution and Small Asteroid Deformation Processes*

- Dr. Stephen Nichols
  - Co-PI on DOE grant ($300k over 2 years)
  - *Fuel-efficient platooning in mixed traffic highway environments*

- Dr. Joe Majdalani
  - Awarded NSF grant ($386k over 3 years)
  - *GOALI: Prediction and Mitigation of Undesirable Acoustic Phenomena in Combustors and Power Generation Systems*

- Dr. David Scarborough
  - Awarded research contract from Solar Turbines
  - *Acoustic Response Measurements of Gas Turbine Engine Combustor Component*
Ongoing Renovations and Improvements

- **Davis 106 – Lt. Col. William W. Petit Aerospace Research Laboratory**
  - Multifunctional Materials Laboratory (Celestine)
  - Polymer Mechanics Laboratory (Mailen)
  - Applied Fluid Dynamics Laboratory (Raghav)
  - Chemical Fume Hoods

- **Gavin Engineering Research Laboratory**
  - Aerospace Materials Laboratory (Celestine, Mailen)
  - Space and Flight Simulation Laboratory (Chakraborty, Guzzetti)

- **Davis 107 – 3D Printing Laboratory**
  - Will provide students with access to modern 3D printing capabilities
  - ABS, HIPS, PLA, Nylon, fiber-reinforced composites, etc.
  - Complement to Center for Additive Manufacturing

- **Brown-Kopel Student Achievement Center**
  - New aerodynamics laboratory (8,000 sq. ft.) containing both instructional and research-grade wind tunnel facilities
Gavin Engineering Research Laboratory
Wind Tunnels

OLD

NEW (2019)
Brown-Kopel Student Achievement Center
Wind Tunnels – Short Term

Wind Tunnels

- 3’ x 4’ Closed-Circuit Subsonic
  - Primarily used for research with some instructional activity
  - Retired

- 2’ x 2’ Open-Circuit Subsonic
  - 50/50 mix between research and instruction
  - Temporarily moved to off-campus research facility

- 4” x 4” Blow-down Supersonic
  - 50/50 mix between research and instruction
  - Permanently moved to off-campus research facility
  - Purchased new compressor/storage tanks
Wind Tunnels - Long Term Plans

Brown-Kopel – Under Construction
- 8,000 ft² for research and instruction
- NEW Aerodynamics Laboratory
  - Multiple subsonic and supersonic experiment stations
  - Small, integrated units directly operated by students
- Propulsion Laboratory
- Existing 2’ x 2’ open circuit tunnel
- NEW Research Tunnels
  - Acquired GM R&D Basic Research Wind Tunnel (28” x 20” closed circuit tunnel)
  - Space for additional facilities

Still developing a vision for a new research tunnel that will establish Auburn as a premiere research institution
BIG IDEAS

- Grow to 20 Tenure-Track Faculty (currently 13)
- Establish an Aerospace Research Center
  - JPL East – Focused on SmallSat mission design, planning and operation
  - Strategic Hypersonic Materials and Manufacturing Technologies
- Aerospace Systems Degree
  - New BS or MS program?
  - Minor or certificate?
  - Online focused?
- Mobile Aerospace Demonstration Laboratory
  - Education and Outreach
  - Vans RV8
- Integrate flight experiences into the curriculum
- Aerospace Research Building
  - Labs, offices, lecture hall, student projects, seminar room, etc.
  - Large classrooms, study spaces, etc.
- Add technical and research support staff
Why are we here?

- **Inform** the Huntsville community about the *new faces of Aerospace Engineering* at Auburn University and the evolving direction of our research portfolio

- **Learn** from the community about present and *future directions of research* that are of significant national interest

- **Identify** specific areas where AE faculty can engage in impactful and transformative research and scholarship

- **Build Long-Term Partnerships** with the community in regards to both *research and education*
Today’s Line-Up

10:00 AM  
Space Sciences & Engineering

Hirabayashi

Guzzetti

11:00 AM  
Aerospace Structures & Materials

Celestine

Agrawal

Mailen
Today’s Line-Up

1:20 PM
Experimental Fluid Dynamics & Propulsion

Raghav
Scarborough
Thurow

2:40 PM
Aerospace Systems, Modeling & Design

Hartfield
Nichols
Chakraborty