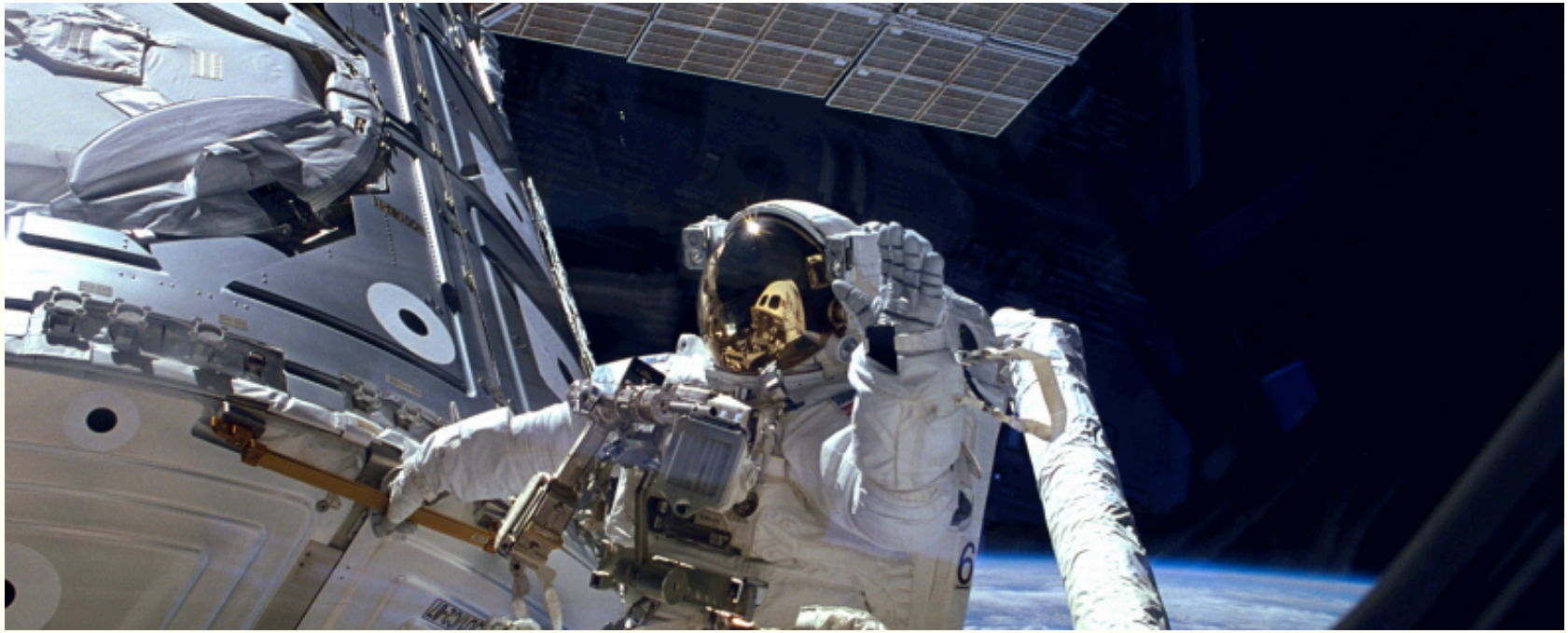


Georgia Space Grant Consortium

Stephen M. Ruffin, Director
stephen.ruffin@ae.gatech.edu
Professor, School of Aerospace Eng.
Georgia Institute of Technology

Southeast Regional Space Grant Meeting
October 24, 2014

GEORGIA
Space Grant Consortium

Georgia Space Grant Consortium

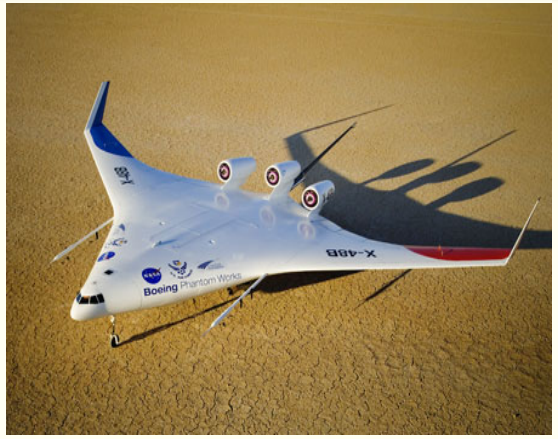
- **GSGC was one of original 17 consortia**
- **21 GSGC Affiliates:**
  - Agnes Scott College
  - Albany State University
  - Armstrong Atlantic State University
  - Clark Atlanta University
  - Columbus State University
  - Fort Valley State University
  - Generation orbit Launch Services, Inc.
  - Georgia Institute of Technology (lead)
  - Georgia Southern University
  - Georgia State University
  - Kennesaw State University
  - Mercer University
  - Morehouse College
  - Museum of Aviation
  - Orbit Education
  - Savannah State University
  - SpaceWorks Enterprises, Inc. (SEI)
  - Spelman College
  - University of Georgia
  - University of North Georgia
  - University of West Georgia
- **3 GSGC Partners**
  - Atlanta Metropolitan State College
  - Central Georgia Technical College
  - West Georgia Technical College
- **Overview of affiliate and partners and their points of contact:** **http://gasgc.org/revampaffiliatesnpartners.php**

Georgia Institute of Technology

Lead Institution for GSGC conducts research in all areas of interest to NASA and is a major contributor to the national engineering workforce

- The undergraduate engineering program ranks 4th in the 2015 America's Best Colleges edition of U.S. News & World Report (published in September 2014).
- All of the programs offered by the College, the nation's largest and most diverse engineering college, placed among the top 10 of their respective areas for the third consecutive year.
- Largest producer of engineering degrees awarded to women & underrepresented minorities.
- 30% of undergraduates participate in co-op program (largest voluntary co-op program in the nation.
- Largest Aerospace Engineering (AE) program in the nation by far (900 Undergraduates, over 500 Graduate students and 38 faculty in AE).
- Roughly 30% of AE research sponsored by NASA

Georgia Tech School of AE



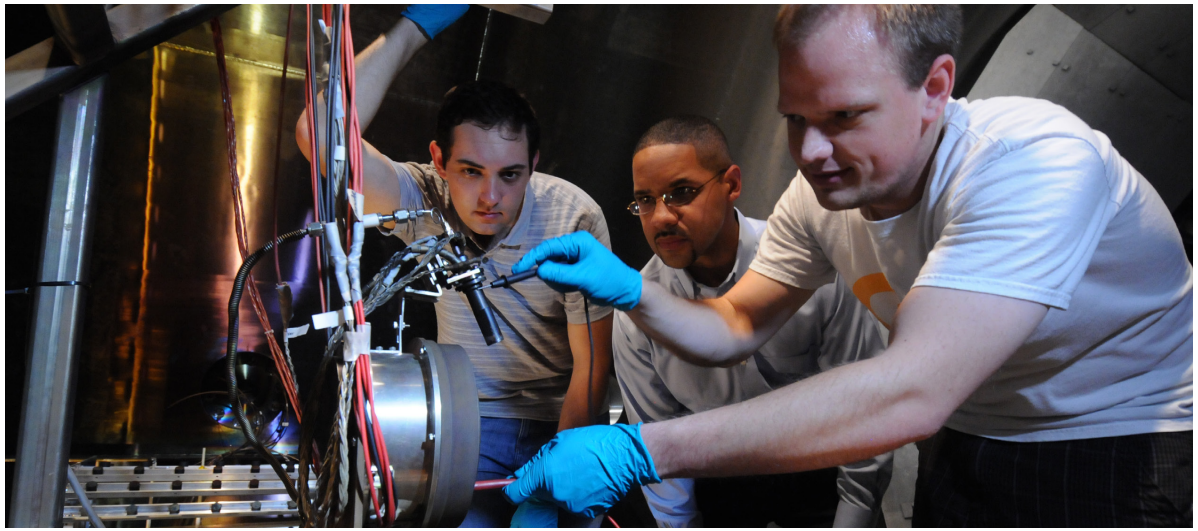
- **Robust Research Programs in 7 Disciplinary Groups:**
  - Aerodynamics and Fluid Mechanics
  - Aeroelasticity and Structural Dynamics
  - Flight Mechanics and Controls
  - Propulsion and Combustion
  - Structural Mechanics and Materials
  - System Design and Optimization
  - Sustainable Energy Systems

Prof. Mitchell Walker in the High-Power Electric Propulsion Lab

- **Listing of all AE Academic Faculty: http://www.ae.gatech.edu/community/staff**
- **Overview of AE Research Program: http://www.ae.gatech.edu/research**

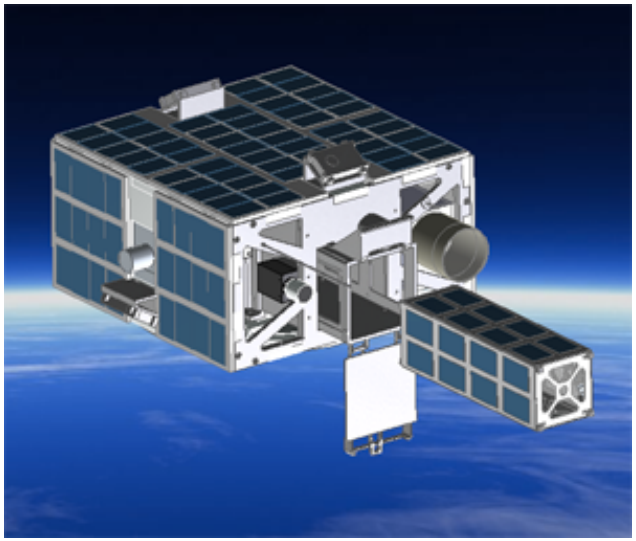
Propulsion and Combustion Group

- **Overview:**
  - Conducts basic and applied research in a wide variety of areas including active control of unsteady phenomena in turbine engine combustors and liquid-fueled rocket engines; microgravity combustion; development of nonintrusive, optical-based diagnostic and sensor techniques; measurement and control of soot and particulate emissions; underwater explosions; combustion mechanisms of composite solid propellants, focusing on modern energetic ingredients used in solid rockets and missiles; pulse combustion; and efficient modeling of realistic, turbulent, single- or two-phase combustion systems using large eddy simulations.
  - http://www.ae.gatech.edu/research/disciplines
- **Faculty:**
  - Krishan Ahuja, Jeff Jagoda, Tim Lieuwen, Suresh Menon, Jerry Seitzmann, Wenting Sun, Mitchell Walker, Vigor Yang, Ben Zinn
  - http://www.ae.gatech.edu/directory/combustion



Center for Space Systems

- **Overview:**
  - Founded in 2008 at the Georgia Institute of Technology with the goal of creating a world-class research and educational organization dedicated to the design, development, and operation of advanced space systems. Through involving students in the full lifecycle of space flight projects, the Center addresses an immediate need within the aerospace community for the development of the next generation of space system engineers. http://www.css.gatech.edu/index.html
- **Sample Projects:**
  - RECONSO University Cubesat Mission
  - Prox-1 University Nanosat Mission
  - Small Probes for Orbital Return of Experiments
- **School of Aerospace Engineering:**
  - David Spencer, Robert Braun, Marcus Holzinger, Panagiotis Tsiotras, Mitchell Walker, Glen Lightsey*
- **School of Earth and Atmospheric Sciences:**
  - Judith Curry, Carol Paty, James Wray
- **School of Electrical and Computer Engineering:**
  - Paul Steffes
- **Georgia Tech Research Institute:** Carlee Bishop, Michael West



Prox-1 Nanosat

New Faculty in AE

Brian C. Gunter

brian.gunter@ae.gatech.edu

http://www.ae.gatech.edu/node/1259

Research

- Satellite geodesy; Earth and planetary observation
- Orbital mechanics; precise orbit determination
- Positioning and navigation using GPS/INS (strapdown) systems
- System theory, parameter estimation, and dense linear algebra
- High-performance computing and software engineering

Marcus J Holzinger

Holzinger@gatech.edu

http://holzinger.gatech.edu/

Research

- Space Situational Awareness
- Guidance, Navigation, and Control
- Information Theory, Optimal Estimation, & Sensor Fusion
- Formation Flight, Rendezvous, and Proximity Operations
- Optimal Control and Reachability

New Faculty in AE

Graeme Kennedy

graeme.kennedy@ae.gatech.edu

http://www.ae.gatech.edu/node/1274

Research

- Analysis and design optimization of composite structures including manufacturing and processing considerations
- High-fidelity static and dynamic aeroelastic design optimization of aircraft
- High-performance parallel computing techniques for high-fidelity multidisciplinary analysis and design optimization
- Homogenization-based beam theory and its application to design of composite sections

Julian Rimoli

julian.rimoli@aerospace.gatech.edu

http://rimoli.gatech.edu/

Research

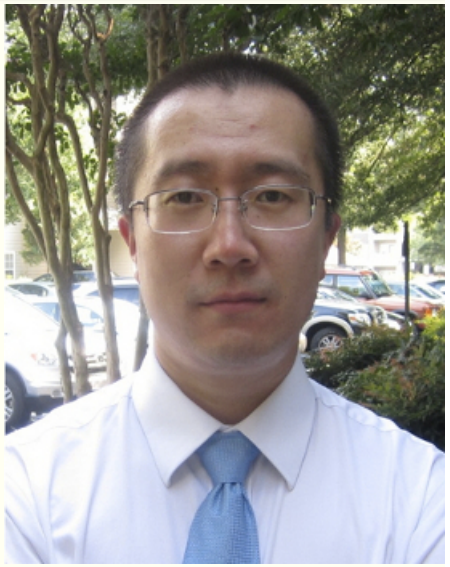
- Computational solid mechanics
- Aerospace applications involving multiphysics and multiscale modeling of solids

New Faculty in AE

Wenting Sun

wenting.sun@ae.gatech.edu

http://ae.gatech.edu/community/staff/bio/sun-w



Research

- Plasma, combustion and plasma assisted combustion
- Laser diagnostics and spectroscopy
- Chemical kinetics of fuels
- Kinetic mechanism reduction and multi-time scale modeling

Evangelos Theodorou

etheodorou3@mail.gatech.edu

http://ae.gatech.edu/community/staff/bio/theodorou-e

Research

- Nonlinear Stochastic Optimal Control
- Machine Learning and Reinforcement Learning
- Statistical Mechanics, Information Theory and Connections to Control Theory.
- Nonlinear State Estimation and Signal Processing
- Adaptive, Nonlinear and Model Predictive Control.

Generation Orbit Launch Services

Relevant research/educational contributions

- Developing air launched single stage liquid rocket for hypersonic flight testing and suborbital research (GOLauncher 1)
- Developing a dedicated nanosatellite launch vehicle (GOLauncher 2)
- Investigating ways to utilize low cost flight test platform for UAV subsystems testing and high school STEM outreach (GO Flight Experiment Testbed)
- Maintain college internship program

Areas of Interest for KSC, MSFC, Stennis

- Under contract to Launch Services Program (KSC) for launch of 3 3U CubeSats in 2016
- Developing processes and procedures for lean, responsive horizontal launch operations from commercial spaceports
- Developing low cost range safety, tracking, and telemetry systems for horizontal launch applications
- Maturing technologies for air launch with cryogenic propellants

GOLauncher 2 departing from Cecil Spaceport in Jacksonville, FL

Contact Info

AJ Piplica, Chief Operating Officer
aj.piplica@generationorbit.com
(404) 991-2212
3353 W Hospital Ave, Atlanta, GA 30341

SpaceWorks

Company Overview:

SpaceWorks Enterprises, Inc. (SEI) is an aerospace engineering company in Atlanta, GA dedicated to helping our customers envision the impact of future technologies, understand the feasibility of proposed space missions, and make strategic decisions regarding future markets. SEI is committed to providing valuable aerospace internship experiences to college students.

Recent College Intern Projects:

Ryan McDonnell: Completion of launch vehicle summaries and comparison assessments

Nicole Davis: Development of an analysis tool for evaluating small satellite constellations

Adam Snow: Populating and analyzing the Launch Demand Database (LDDB) and assisting with cost estimation/tool work for NASA LaRC OCFO/OSACB

Laura Otero: Habitat and launch vehicle cost estimation, modification and data population of the Cost Research and Analogy Library (CoRAL)

Contact:

John R. Olds, Ph.D., P.E.

Chief Executive Officer, SpaceWorks Enterprises, Inc.

john.olds@sei.aero | +1.770.379.8002

Educational Outreach:

- SEI has hosted 56 college interns since 2004 (92 total)
- Strong partnership with the GSGC since 2007
  - 50/50 intern cost sharing
- Over 90% of our total former interns have graduated with or are in the process of pursuing a STEM degree
- 80% of our total former interns who have graduated college are now in a STEM Career
  - 54% of our total former interns in a STEM career are currently working in an Aerospace Career

A Few of Our Former College Interns:

Georgia Tech

Columbus State University

Coca Cola Space Science Center

GEORGIA Space Grant Consortium

Dr. Valerie Neal

Curator, National Air and Space Museum at the Smithsonian Institute

Please join us for an evening of fun, food, and education about the CCSSC's most recent NASA acquisition, a quarter-scale, engineering model of the space shuttle

Thursday, November 13, 2014

Cocktails 6 p.m. • Program 7:15 p.m.

RSVP: Dutch Cummings: 706-649-1477

Dr. Neal joined the Smithsonian as a curator in 1989 and is responsible for artifact collections from the Space Shuttle era and International Space Station, most prominently the orbiter, *Discovery*. She led the museum's effort to prepare the shuttle test vehicle Enterprise for public display and to acquire Spacelab, *SpaceShipOne,* and the Manned Maneuvering Unit for the national collection.

Albany State University

Undergraduate Research & Outreach

- Research Experience in Payload Design and Launch with Weather Balloon
- Agricultural Application of Unmanned Aerial Vehicle
- Southeast Georgia Regional Model Bridge Building Competition
- Science Engineering Technology Program
- Saturday Engineering Workshop

Albany State Univ. High Altitude Balloon launch

High school and middle-school students from Dooly County in Bridge Building competition

Contact Info:
Atin Sinha, Ph.D., P.E. e-mail: atin.sinha@asurams.edu
Professor and Coordinator of Engineering
Albany State University
Albany, GA 31705

Agnes Scott College

Bradley Observatory

- Astronomical teaching and research facility located on the campus of Agnes Scott College. Contains the 70-seat Delafield Planetarium and a 100-seat capacity lecture hall. The large dome atop the Observatory houses the 30-inch Lewis H. Beck telescope.
- The Observatory hosts approximately 1500 local and regional K12 students per year for field trip visits. Field trips are hosted by faculty and students.

6th graders at Renfroe Middle School on September 29, 2014 at the dedication of the new SpaceView system, which provides a live feed of astronomy and earth science programming updated daily

- The Observatory houses a faculty/student observing room that connects us to two remotely operated 1-m class telescopes, one at Kitt Peak and on at Cerro Tololo. We are members of the SARA consortium that operates the telescopes.
- **Point of Contact**: Chris De Pree (cdepree@agnesscott.edu) 404 471 6266

Georgia State University

Overview of relevant research

- GSGC supports work in stellar astrophysics at Georgia State University
- Graduate students are conducting research using the GSU CHARA Array interferometer at Mount Wilson, California, to measure the sizes of stars, and they use data from the NASA Kepler mission to study masses and pulsational properties of binary stars

Areas of interest for NASA KSC, MSFC, or Stennis collaboration

- GSU research includes some gamma-ray emitting binary stars that are targets of study at MSFC

GSGC Fellow Kathryn Gordon (center, front row) at the Very Large Telescope Interferometer summer school in southern France

Contact Info
Douglas Gies
Physics & Astronomy
Georgia State University Atlanta, GA 30303
gies@chara.gsu.edu

University of Georgia

NASA Science Writing Challenge

- High school students work with University research scientists
- Develop scientific news story by infusing NASA subject matter
- Winners receive an all-expense paid trip to NASA space camp
  - U.S. Space and Rocket Center
- Winners' news stories are published in local newspaper

Contact Info
Be-Atrice Cunningham beatrice@uga.edu
Project Manager, Office of the Assistant Dean
College of Agricultural and Environmental Sciences
The University of Georgia Griffin Campus
1109 Experiment Street
Griffin, GA 30223
(770) 228-7392

Armstrong Atlantic State University

- **Each One Teach One**
  - **http://www.armstrong.edu/site/spotlight/spotlight_each_one_teach_one**

- **Engineering Design Challenge 2014**
  - **http://savannahnow.com/news/2014-04-27/savannah-high-school-students-show-hovercraft-skills**

Contact Info
Cameron Coates, PhD, PE
cameron.coates@armstrong.edu
Armstrong Atlantic State University
Savannah GA 31419
(912) 344-2693

Orbit Education, Inc.

Overview

- Non-profit organization based in the metropolitan Atlanta area, but has K-12 and informal education collaborations throughout the State.
- Works with Kennedy Space Center Education Specialists to provide NASA content to K-12 schools.
- Works with NASA Resource Centers, K-12 public and private institutions, colleges and universities and industry to provide pre-college programming for students and in-service programs for teachers.

Contact Info

Mr. Tony Docal, President
400 W. Peachtree Street, NW #2614
Atlanta, GA 30308
Oei1@mac.com (678) 360-2007