NIA

NATIONAL INSTITUTE OF AEROSPACE

RESEARCH • GRADUATE EDUCATION • OUTREACH

2013 Annual Report

NATIONAL INSTITUTE OF AEROSPACE

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Front cover: Rose Weinstein, UMD Morpheus Lab student, and Sing Sing, a robot bird

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Dr. Fuh-Gwo Yuan
NIA Samuel P. Langley Professor
North Carolina State University
Center for Smart Structures and Materials

Dr. Douglas O. Stanley

President's Message

2013 marked my first full year serving as the President and Executive Director of the National Institute of Aerospace. It was an exciting year with many accomplishments. Despite significant federal budget pressures, we achieved $28 million in annual revenues.

In 2013, we completed an extensive strategic planning activity together with our employees and Board of Directors. As a result, we have a new vision:

> "to be a recognized leader in innovative aerospace research, exemplary education, and inspirational outreach."

We also developed a common mission, objectives, and values described later in this report. One of our key objectives is to: "establish collaborative research and education centers that are internationally recognized for important intellectual contributions in aerospace-related engineering, science, and technology." We made significant progress during 2013 in accomplishing this mission. We established a new Center for Planetary Atmospheres and Flight Sciences under the leadership of Dr. Jared Bell, NIA Senior Research Scientist. This Center already has almost $2M in active research funding and collaborations with 10 different universities and research institutes. NIA also welcomed 17 visiting researchers in 2013 and hosted more than 50 seminars.

In 2013, our new Boron Nitride Nanotube (BNNT) Lab began operation in our recently established Research and Innovation Laboratories under the leadership of NIA Fellow Dr. Cheol Park. NIA's patented BNNT production process (held jointly with the Jefferson Lab and NASA Langley Research Center) enables manufacture of the highest quality BNNT in the world as measured by aspect ratio and purity. We have also licensed this technology to BNNT, LLC which is working on increasing the yield to levels required for commercialization. See pages 4-6 to read more about this exciting research.

You will also read about the important research activities and labs of Prof. Fuh-Gwo Yuan, Samuel P. Langley Professor from North Carolina State University, in integrated structural health monitoring, embedded sensors, smart materials, and energy harvesting. Each of our member universities has a full-time Langley Professor located at NIA. In recognition of the quality of Prof. Yuan's research, he was honored in 2013 as the Structural Health Monitoring Person of the Year at the 9th International Workshop for Structural Health Monitoring.

Our unique graduate education program reached a milestone of 144 graduates in 2013. Our students can earn degrees from any of our 9 member universities and take up to half of their classes from other universities.

NIA's new Peninsula Technology Incubator is now nurturing 16 small businesses with over $3M in annual revenues and is commercializing NIA intellectual property.

2013 was also a year of many awards for NIA and our faculty and staff. Dr. Hyun Jung Kim of NIA was named the Young Engineer of the Year from the AIAA Hampton Roads Section. NIA researchers have now won this award for three of the past four years. NIA students from the University of Virginia (Dennis Waldron, Duncan McGillivray, Craig Ungaro, and Ankit Shah) won an international competition to design a solar-powered wheel chair sponsored by United Cerebral Palsy. Their faculty advisor, Prof. Mool Gupta, Samuel P. Langley Professor from the University of Virginia, was also named a Fellow of the Optical Society. NIA researchers were awarded 10 US Patents and received four different NASA Group Achievement Awards.

Finally, our world-class educational and public outreach programs continued to garner new customers, audiences, and awards. Our flagship NASA 360 TV program, which has had more than 15 million downloads from NASA.gov, won an Emmy award this year for its Robot, Rocks, and Rovers episode. We partnered with NASA and Lockheed Martin to launch the NASA Exploration Design Challenge for students in grades K-12. Our Center for Integrative STEM Education also continued to provide unique and exciting teacher training, curriculum development, student competitions, and a variety of educational outreach activities.

I look forward to working with each of you and all of our stakeholders as we continue to create a "culture of collaboration" at NIA.

ODU Students Win First Place in RASC-AL Wheel Challenge

In 2013, the first Lunar Wheel Challenge was held as part of the Revolutionary Aerospace Systems Concepts-Academic Linkage (RASC-AL) project. Teams were challenged to design and build prototype wheels for a space exploration vehicle that could withstand the environments experienced on the moon and Mars. Teams delivered four functioning wheels that were tested in the NASA Johnson Space Center rock yard on an off-road utility vehicle and presented their wheel concept to a design review panel.

A total of 11 students participated in the 2013 Roll-Off Competition sponsored by NASA and organized by NIA. The team from Old Dominion University claimed first place, the University of Wisconsin-Milwaukee team earned second place, and the University of Maryland secured third place.

Bo Walkley
Vice President, Research & Program Development

One of the challenges I have in managing a multi- disciplinary, multi-faceted staff of technical specialists is simply keeping up with the pace of their efforts in adding to the aerospace body of knowledge. NIA's researchers continued over this past year to make significant contributions in areas as diverse as computational fluid dynamics, sonic boom minimization, advanced materials (including nano technologies), formal methods, atmospheric sciences, and airspace research (with a growing emphasis on unmanned systems and autonomy).

Several examples of our research activities follow; and I would like to particularly note the work of our Research Scholars, two of whom are featured in this report. NIA provides this post-doctoral experience as an opportunity for young PhDs to gain additional highly relevant and challenging research to prepare them further for a career in research or academia.

Each occurrence of technical progress has behind it an individual NIA researcher who is highly trained, skilled and motivated. Often in collaboration with NASA or our industry partners, NIA's researchers continue to distinguish themselves and their collaborative teams with outstanding technical accomplishments.

NIA researchers received 15 NASA Langley Research Center Inventor Awards throughout the year.

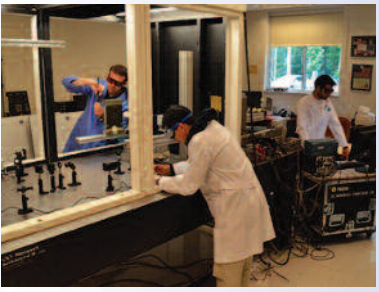
Samuel P. Langley Professor Dr. Fuh-Gwo Yuan, North Carolina State University

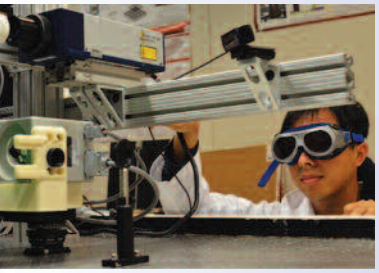
Professor Fuh-Gwo Yuan at NIA and a faculty member of the Department of Mechanical and Aerospace Engineering at North Carolina State University, is an internationally recognized expert in the field of structural health monitoring, smart materials and structures, wireless sensing, and energy harvesting. With over two decades of collaboration with NASA Langley Research Center scientists and engineers and his tenure as a Langley Professor at the NIA, Professor Yuan has developed state-of-the-art research facilities at North Carolina State University Centennial campus and within the NIA Research and Innovation Laboratories facility. He has always recruited graduate students with a multi-disciplinary background and, through his leadership, he supports them to methodically solve the most challenging technical problems.

Currently Prof. Yuan advises 20 PhD students and works with five visiting scholars and post-docs. Seven are Graduate Research Assistants who conduct research at both NASA Langley Research Center and in Prof. Yuan's Integrated Structural Health Management Laboratory at NIA. In addition, Prof. Yuan also advises thirteen graduate students who are working at his Smart Structures and Materials Laboratory at North Carolina State University and are supported by external grants. Yuan teaches a course on structural health monitoring which exposes students to sensors and signal processing methods for continual monitoring of the health of structural systems.

Professor Yuan's state-of-the-art laboratories are dedicated to the development of smart structures for the next generation of aerospace, mechanical and civil structures.

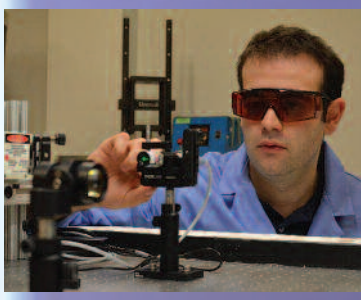
Professor Yuan was honored in 2013 with a Structural Health Monitoring Person of the Year (SHM-POY) Award at the 9th International Workshop for Structural Health Monitoring. *Professor Yuan was recognized for having made an outstanding contribution to the field of SHM by developing a series of wireless sensors for aerospace applications, energy harvesting for powering wireless sensors, the first piezoelectric based wireless for active damage diagnosis and passive acoustic emission, and the first integrated wireless SHM system for bridges in North Carolina.*





Smart Structures and Materials Laboratory – Located within Centennial Campus engineering facility at North Carolina State University, students and Fellows are engaged in the design of wireless sensor networks for passive and active sensing, devices and technologies instrumental in developing advanced structural health monitoring systems, as well as signal processing and damage diagnosis/prognosis algorithms and energy harvesting techniques.

Integrated Structural Health Management Laboratory – This laboratory, at NIA, focuses on research related to automated, rapid, fully non-contact technologies for Nondestructive Evaluation (NDE) of composite structures. The laboratory has a fully enclosed laser-based automated NDE scanning system equipped with high power pulse laser, laser Doppler vibrometer, galvomirrors head and other optical devices. In addition, the lab features a fully automated air-coupled ultrasonic based system integrated with robotic biaxial translation stage for scanning of large complex structural systems.



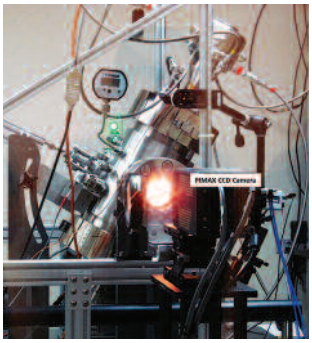
NIA's Boron Nitride Nanotube (BNNT) Research Lab

Dr. Sang-Hyon Chu

Since July 2013, the new NIA boron nitride nanotube (BNNT) science rig has been running to synthesize BNNTs and perform optical diagnostics. NIA and NASA Langley Research Center are collaborating to create and enhance a groundbreaking ability to optimize the quality and quantity of BNNTs as well as to understand the fundamental science of BNNT formation.

BNNT represents a new class of materials that is super-strong and textile-like with the appearance of cotton. It has a molecular backbone 100 times stronger than steel, and the BNNTs are as strong as the better-known carbon nanotubes, but much more heat resistant - up to 800° C or 1472° F in air. BNNT material also exhibits piezoelectric properties and has high radiation shielding capability. These unprecedented properties of BNNT make it a prime candidate for applications ranging from ultra-light robust structural materials for extremely harsh environments, to new water filtration capabilities, or even potential cancer therapies.

Boron nitride nanotube grown in the NIA BNNT chamber.

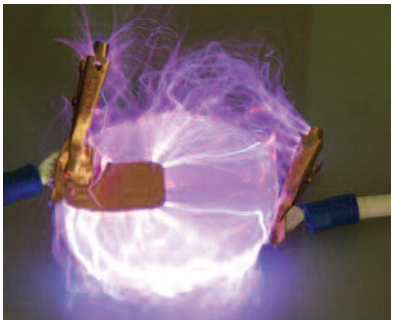


BNNT synthesis in the NIA BNNT rig with optical diagnostic system operating.

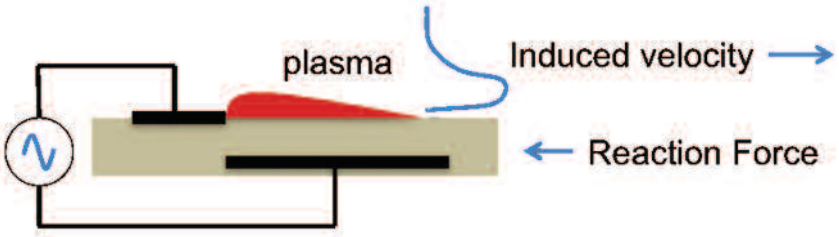
The new NIA reaction chamber features an extremely stable diffusion-cooled CO^2 slab laser (2.5 kW) and is capable of operating at pressures from 1 to 68 atm (1000 psig). Currently it is equipped with in-situ optical diagnostic instruments including NASA Langley provided planar laser-induced fluorescence (PLIF), shadow graph, and high speed camera (1000 frames/sec). The ultimate goal is to understand the nucleation and growth of BNNT and the synthesis optimization for targeted applications as well as optimization of BNNT production and quality.

Low Loss and High Breakdown Strength: Novel Dielectrics for Plasma Actuators

Dr. Godfrey Sauti and Dr. Tian-Bing Xu



Researchers at NIA, NASA Langley's Advanced Materials and Processing Branch (AMPB), the Flow Physics and Control Branch at the NASA Glenn Research Center, and the Ohio Aerospace Institute (OAI) have been carrying out collaborative research

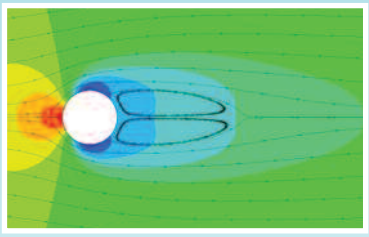


to develop new materials for improved plasma actuator performance. Plasma actuators and specifically dielectric barrier discharge (DBD) actuators are dynamic flow control devices that can be used in a variety of aeronautical applications, such as separation control for fixed and rotary wing aircraft, internal flows, turbomachinery and wind turbines to reduce drag. The primary function of these flush mounted surface devices is to impart momentum to low speed flow. They have found greatest application in control of steady and unsteady boundary layer flow separation. Additional potential applications include: on-demand airfoil and fuselage separation control for V/STOL aircraft, deployed landing gear noise reduction, rotorcraft retreating blade stall alleviation, control of tail boom vibrations due to cyclic rotor downwash, jet engine turbine blade separation at cruise conditions, and as a source of controlled disturbance inputs for active high-speed laminar-flow-control techniques. The NASA, NIA, and OAI research activities have been focused on flexible aerogel dielectrics with dielectric constants close to one and high dielectric breakdown strengths, as well as investigating the role of the bulk and surface chemistry on the ability to generate a plasma with relatively higher energy density and higher output momentum.

Development of Advanced Computational Fluid Dynamics Methods

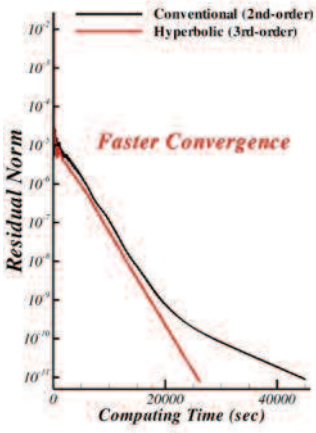
Dr. Hiro Nishikawa

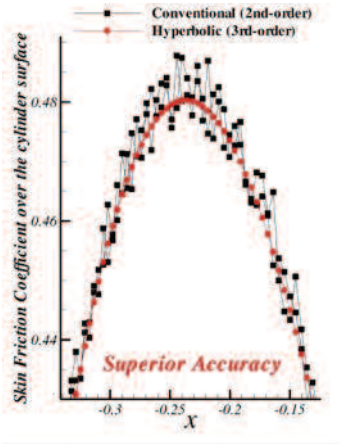
Computational Fluid Dynamics (CFD) has become an indispensable tool for engineers and scientists today, enabling them to perform experiments and designs on a computer, in a wide range of application area, from aerospace engineering (e.g., flow around an aircraft) to medical biology (e.g., blood flow). Modern applications require higher-order accuracy but the increase in computational cost in implementing higher-order methods precludes the use of such methods in practical CFD codes.



The hyperbolic method, developed at NIA in 2007, has been used as a radical new approach to CFD. The method enables higher-order accuracy at a reduced cost. By manipulating the fluid dynamics equations of mixed hyperbolic-parabolic type into a single first-order hyperbolic system, the method greatly simplifies the construction of high-order schemes; eliminates the numerical stiffness due to second-derivatives for faster convergence; and allows accurate computations of derivative quantities of interest such as viscous stresses and heat fluxes on fully unstructured grids.

The research focuses on the development of a third-order finite-volume scheme for viscous flow simulations. Latest results demonstrate the seemingly impossible improvement: the third-order hyperbolic scheme yields a highly smooth viscous force distribution on irregular grids for which a conventional second-order method suffers from oscillations. Moreover the third-order solution is obtained faster than the second-order solution on the same grid. Successful implementation into a three-dimensional practical CFD code will enable rapid high-fidelity engineering computations and design optimizations for complex geometries. Manipulating the governing equations will extend the potential applications to a wide range of scientific-computing communities beyond fluid dynamics.





Molecular Dynamics Modeling of Piezoelectric Boron Nitride Nanotubes

Dr. Vesselin Yamakov

Boron nitride nanotubes (BNNTs) exhibit electroactive behavior in response to mechanical deformation, but the origin of this phenomenon is not well understood. The goal of this study is to explain how atomic scale structural changes produce macroscopically observable electrical behavior. A new atomistic constitutive model is being developed and validated for use in molecular dynamics and continuum mechanics simulations aimed at systematically exploring the nature of the electro-mechanical coupling observed in this material. Specific outcomes from this work will be a validated hexagonal BN constitutive model that incorporates the physical effects required to correctly represent the electroactive properties of BNNTs and a mechanistic understanding of how their atomic structure (see figure above) couples to an external electric field. Achieving this will permit the development of light-weight structural sensors/actuators for Integrated Vehicle Health Management in extreme environments with previously unachievable combinations of strength, toughness, and thermal stability. The study was funded by NASA Langley IRAD Program.

2013 AIAA Young Engineer of the Year Award

Dr. Hyun Jung Kim, a research scientist at NIA working in the field of solid-state physics and energy harvesting, is the 2013 recipient of the Robert A. Mitcheltree Young Engineer of the Year Award. This award, presented by the Hampton Roads Section of AIAA, one of the largest chapters of the professional organization in the nation, is highly competitive. Dr. Kim was recognized for excellent contributions to the development of advanced thermo-electric and micro-electronic materials leading toward improved energy conversion efficiency for thermo-electric power generation.

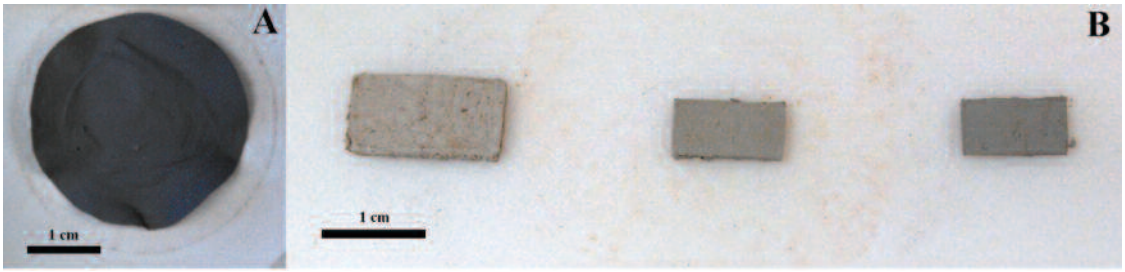
NIA Research Scholars: The Post-Doctoral Experience

Development of Boron Nitride Nanotube Structural Composites

Dr. Amanda Tiano

In order to reduce vehicle weight for space and aerospace applications, boron nitride nanotubes (BNNTs) have attracted significant interest for their potential use in structural nanocomposites. As light-weight, multifunctional materials, BNNTs are also capable of fulfilling other critical roles beyond structural reinforcement, such as an electrical insulator, neutron radiation shield, thermal protection, and mechanical sensor/actuator. The challenge to achieving their incorporation into structural nanocomposites focuses on overcoming the strong intermolecular forces between nanotubes that causes bundling and aggregation, which is detrimental to the properties of the nanocomposite. Hence, achieving a stable, uniform dispersion of individual BNNTs within a matrix enables researchers to effectively harness their extraordinary properties.

NIA Research Scholar Dr. Amanda Tiano has been working with researchers at NIA and NASA Langley Research Center to determine methods to effectively disperse BNNTs for the fabrication of BNNT nanocomposites. Utilizing a thermodynamic approach, a variety of solvents and co-solvent systems were explored. By correlating these results with known solubility parameters for each solvent and co-solvent, a region of BNNT solubility was determined. This has subsequently enabled the research group to fabricate BNNT structural composites by selecting suitable polymers and epoxy resins with solubility parameters within the region of BNNT solubility. BNNT mats have been successfully fabricated via vacuum filtration of a well-dispersed solution of BNNTs. The mats can be subsequently infiltrated with a desired epoxy or polymer solution to yield a composite. An alternative method was recently developed which is capable of generating high weight percent (wt%) nanocomposites. With this new approach, composite samples containing up to 75 wt% BNNT with various polymers such as polyurethane, poly (methyl methacrylate), polystyrene, polyacrylonitrile and LaRC™-CP2 polyimide have been fabricated. Dr. Tiano's research is currently focused on generating and mechanically testing large-scale BNNT composites to elucidate the potential of BNNTs as structural reinforcements.



Example of a BNNT mat fabricated by vacuum filtration (A) and small scale BNNT-LaRC CP2 composite samples containing 33 wt%, 50 wt%, and 67 wt% BNNT from left to right (B). (Image modified from Tiano et al. Proc. SPIE 9060.)

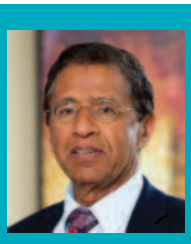
Generation of Novel Polymeric Systems with Tailored Surface Properties

Dr. Jereme Doss

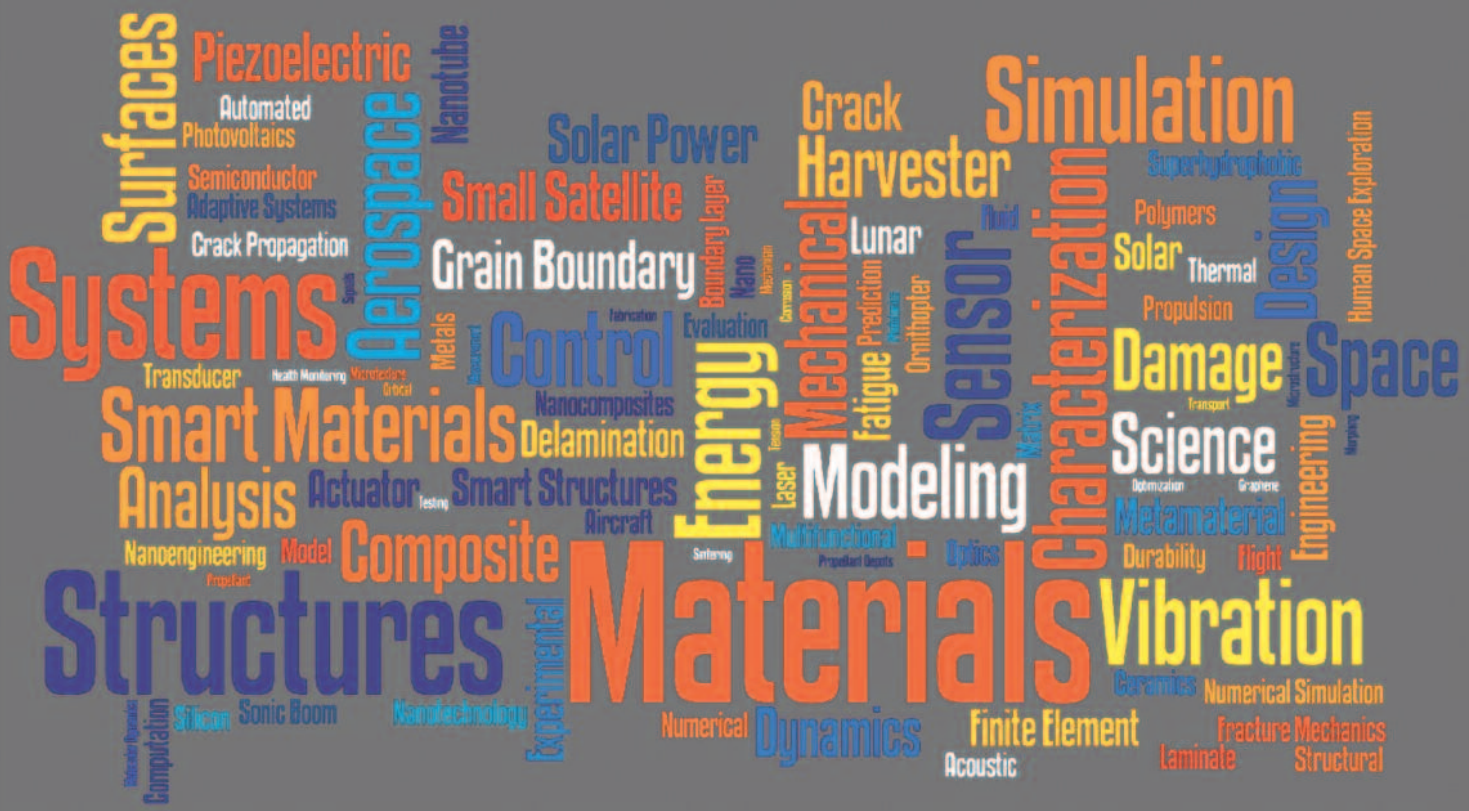
As part of an effort to develop coatings with abhesive properties (prevent adhesion), novel polymeric materials are being synthesized, characterized and surface properties investigated. The approach to impart abhesive properties to these polymers involves chemical modification using novel oligomers that thermodynamically migrate to the surface of the material and thereby alter surface energy. Coatings were fabricated by spraying solutions of the polymers onto aluminum sheets followed by drying. The coatings were characterized thermally, microscopically, mechanically, spectroscopically and surface properties were measured using contact angle goniometry. Based on initial characterization results, several promising candidates were selected for further evaluation as part of the NASA Langley Environmentally Responsible Aviation (ERA) Project.

One activity under the ERA project is focused on mitigating adhesion of insect residue on critical airflow surfaces because the insect residue can potentially disrupt the laminar air flow. The screening experiments involved placing coating samples in a small scale wind tunnel and conducting surface impact experiments using flightless fruit flies. Insect residue impact dynamics were recorded via high speed photography at 50,000 frames per second. Variations in the degree of primary residue adhesion, secondary residue adhesion, and airjet-induced residue detachment were observed on the collected footage. The impact residues were subsequently characterized using an optical profilometer that provided insect residue height and areal coverage data. Based on these screening test results, the best performing coatings were subsequently evaluated in a larger wind tunnel (Basic Aerodynamics Research Tunnel, BART) on a NACA 0015 airfoil.

Upon the completion of the BART wind tunnel test, several experimental polyurethanes were flown on a flight experiment conducted out of NASA Langley on a Falcon jet (see photo with Dr. Doss in blue shirt). Based on the overall evaluations conducted in this work, two experimental polyurethanes were selected to fly on the ERA sponsored Eco-Demonstrator flight experiment in 2015.



In 2013, Dr. Mool C. Gupta was elected as a Fellow in the Optical Society (OSA). OSA is a professional society of optical engineers and scientists devoted to advancing the fields of optics and photonics. Dr. Gupta was recognized for contributions to high-power laser material interactions and their applications in optical data storage, photovoltaics, optics devices, and ferroelectric materials.



Research

Research Publications

Computation, Modeling, and Simulation

M.M. Choudhari, F. Li, L. Duan, C.-L. Chang, M.H. Carpenter, C.L. Streett, and M.R. Malik, "Towards Bridging the Gaps in Holistic Transition Prediction via Numerical Simulations," AIAA Paper 2013-2718, in the Proceedings of the 43rd Fluid Dynamics Conference, June 2013, San Diego, CA

N.V. De Carvalho, B.Y. Chen, S.T. Pinho, P. Baiz, T.E. Tay, and J.G. Ratcliffe, "Floating Node Method and Virtual Crack Closure Technique for Modeling Delamination-Matrix Cracking Migration," in the Proceedings of ICCM19, July 2013, Montreal, Canada

L. Duan, and M.M. Choudhari, "Direct Numerical Simulation of Transition in a Swept Wing Boundary Layer," AIAA Paper 2013-2617, in the Proceedings of the 43rd Fluid Dynamics Conference, June 2013, San Diego, CA

L. Duan, and M.M. Choudhari, "Numerical Study of Pressure Fluctuations Due to a Mach 6 Turbulent Boundary Layer," AIAA Paper 2013-0532, in the Proceedings of the 51st Aerospace Sciences Meeting, January 2013, Grapevine, TX

S.J. Gill, M.H. Lowenberg, L.G. Crespo, B. Krauskopf, S.A. Neild, and G. Puyou, "Bifurcation Analysis of the Generic Transport Model for Open-Loop and Closed-Loop Configurations," AIAA Paper 2013-5080, in the Proceedings of the AFM Conference, August 2013, Boston, MA

V.K. Gupta, J.D. Hochhalter, E. Saether, S.A. Willard, A.D. Spear, T.A. Wallace, S.W. Smith, and E.H. Glaessgen, "High-Resolution Image Correlation, EBSD-Based Characterization and Simulation of Crack Tip and Grain Boundary Deformation in Al-Cu Alloys," in the Proceedings of the TMS 2013 142nd Annual Meeting, March 2013, San Antonio, TX

V.K. Gupta, J.D. Hochhalter, V.I. Yamakov, S.A. Willard, A.D. Spear, S.W. Smith, and E.H. Glaessgen, "Experimental Characterization and Simulation of Slip Transfer at Grain Boundaries and Microstructurally-Sensitive Crack Propagation," in the Proceedings of the 13th International ASTM/ESIS Symposium on Fatigue and Fracture Mechanics, November 2013, Jacksonville, FL

J.D. Hochhalter, V.K. Gupta, S.A. Willard, A.D. Spear, S.W. Smith, and E.H. Glaessgen, "In-Situ Measurements and Simulations of Grain Boundary Slip Localization in Al-Cu," in the Proceedings of the TMS 2013 142nd Annual Meeting, March 2013, San Antonio, TX

E. Jeyapaul, and G.N. Coleman, "Higher-Order Moments and their Modeling Approximations in Turbulent Channel Flow," in the Proceedings of the 66th Annual Meeting of the APS Division of Fluid Dynamics, November 2013, Pittsburgh, PA

E. Jeyapaul, and C.L. Rumsey, "Analysis of Highly-Resolved Simulations of 2-D Humps Toward Improvement of Second-Moment Closures," AIAA Paper 2013-0684, in the Proceedings of the 51st Aerospace Sciences Meeting, January 2013, Grapevine, TX

W.L. Leser, F.-G. Yuan, and A. Newman, "Band-Limited Green's Functions for the Quantitative Evaluation of Acoustic Emission using the Finite Element Method," in the Proceedings of the 54th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics, and Materials Conference, April 2013, Boston, MA

H. Nishikawa, B. Diskin, J.L. Thomas, and D.H. Hammond, "Recent Advances in Agglomerated Multigrid" AIAA Paper 2013-0863, in the Proceedings of the 51st Aerospace Sciences Meeting, January 2013, Grapevine, TX

S.T. Pinho, B.Y. Chen, N.V. De Carvalho, P.M. Baiz, and T.E. Tay, "A Floating Node Method for the Modeling of Discontinuities within a Finite Element," in the Proceedings of the 19th International Conference on Composite Materials (ICCM19), July 28th – August 2nd, 2013, Montreal, Canada

A. Sadrpur, L.G. Crespo, and S. Kenny, "Analysis of Nonlinear Systems via Bernstein Expansions," AIAA Paper 2013-4557, in the Proceedings of AIAA GNC Conference, August 2013, Boston, MA

N.H. Schiller, B.S. Beck, and A. Slagle, "Numerical Study of Sound Transmission Through a Thin Partition Lined with Slow Acoustic Treatment," in the Proceedings of Noise-Con 2013, August 26-28, 2013, Denver CO

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A.A. Wissa, N. Guerreiro, J. Grauer, J.E. Hubbard Jr., C. Altenbuchner, Y. Tummala, M. Frecker, and R. Roberts, "Flight Testing of Novel Compliant Spines for Passive Wing Morphing on Ornithopters," in the Proceedings of the 21st AIAA/ASME/AHS Adaptive Structures Conference, April 8-11, 2013, Boston, MA

Space & Flight Systems

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M.A. Simon and A.W. Wilhite, "A Tool for the Automated Design and Evaluation of Habitat Interior Layouts," AIAA Paper 2013-5305, in the Proceedings of the AIAA SPACE 2013 Conference and Exposition, September 10-12, 2013, San Diego, CA

A. Wilhite, D. Arney, and P. Chai, "The Utilization of Launch Vehicles Core Stages and Propellant Depots for Human Space Exploration," AIAA Paper 2013-4177, in the Proceedings of the 49th AIAA/ASME/SAE/ASEE Joint Propulsion Conference, July 14-17, 2013, San Jose, CA

NIA Researchers were issued:

10 United States Patents **&** **2** Patent Application Awards

Year: 2013

PENINSULA TECHNOLOGY INCUBATOR

Peninsula Technology Incubator

NIA is committed to the mission of economic development in the City of Hampton and the Virginia Peninsula and strongly believes that entrepreneurship can and should play a more significant role in job creation, wealth creation and retention of the best and brightest graduates of the regional universities. Toward this effort, the Peninsula Technology Incubator (PTI) was incorporated in April 2012 by NIA as a subsidiary. Funded by the Economic Development Authority for the City of Hampton, Virginia, sponsorship from other municipalities and larger local companies, and license fees paid by clients, PTI provides startups with necessary resources as they mature, raise capital and implement their business plan.

PTI's programs focus on an annual "Pipeline Process" starting in October with "Pitch Perfect", a series of workshops designed to assist the budding entrepreneur with skills necessary to build a successful elevator speech. This is followed by Start! Peninsula, a weekend-long intensive competition to get resources to the best ideas and entrepreneurs. Start! Peninsula is followed by an eight week intensive Accelerator Program that gives the developing entrepreneur additional skills they may be lacking in areas ranging from accounting, to financial modeling, human resources, intellectual property and business law, sales and marketing. After successful completion of the Accelerator, clients' companies are given the opportunity to pitch to real investors. The very best have received hundreds of thousands of dollars in investment capital. In addition to our "Pipeline Process," PTI provides a space to collaborate and access to area business leaders that help mentor young companies. The PTI is located on the third floor of NIA's Research & Innovation Laboratories facility and has already recruited almost twenty physical and virtual clients.

NIA's Visitor Program facilitates research collaborations between scientists and engineers at NIA, NASA Langley Research Center, and researchers, faculty, and graduate students from other institutions. The typical visit is for a semester or summer, but longer or shorter durations are easily accommodated. NIA supports this program with concierge services to assist with securing local lodging and transportation, visas for our international guests, access badges for NASA Langley Research Center, office accommodations and compensation. Participants usually conclude their stay with a seminar for our resident faculty, research staff, students and researchers from the NASA Langley Research Center community.

2013 NIA Visitor Program

Visiting Researchers:

Loic Correnson
CEA-LIST Institute Software Security Lab, France
"Formal Methods and Software Validation"

Meredith Elrod
University of Virginia, United States
"Atmospheric Waves in Both the Atmospheres of Titan and Mars"

Aaron Katz
Utah State University, United States
"Multi-grid Developers for Strand Grids in CREAT AV"

Soshi Kawai
Institute of Space and Astronautical Science, Japan
"Wall Modeling"

H. Alicia Kim
University of Bath, United Kingdom
"Aero-Structural Topology Optimisation for Fixed Wing"

Mark Lowenberg
University of Bristol, United Kingdom
"Stability and Bifurcation Analysis of the Generic Transport Model"

Paolo Masci
Queen Mary University of London, United Kingdom
"Formal Methods Technologies for Verification and Validation of Software"

John McDermid
University of York, United Kingdom
"Software Assurance and Dependability"

Masahiko Miyauchi
Kaneka Corporation, Japan
"High Temperature Composite Matrix Resins"

Toshiharu Mizukaki
Tokai University, Japan
"Advanced Measurement Techniques for Wind Tunnel Measurement"

Camilo Rocha Nino
Escuela Colombiana de Ingenieria, Colombia
"Symbolic Reachability Analysis for PLEXIL"

Axel Schwoeppe
DLR – German Aerospace Center, Germany
"Computational Fluid Dynamics"

Sudip Sen
Lancaster University, United Kingdom
"Nowcast of Atmospheric Ionizing Radiation for Aviation Safety"

Koji Shimoyama
Tohoku University, Japan
"Wall Modeling"

Knut Stamnes
Stevens Institute of Technology, United States
"Lidar Retrievals of Atmospheric Properties"

Christian Urban
King's College, United Kingdom
"Verification of Clock Algorithms"

Daniele Versino
Los Alamos National Laboratory, United States
"Solid Mechanics, Composite Modeling"

Visiting Students

Christopher Brampton
University of Bath, United Kingdom
"Structural Optimization of Carbon Fiber Plates"

Erika Brattich
University of Bologna, Italy
"Comparison between the NASA GMI Chemistry and Transport Model"

Alejandro Campos
Stanford University, United States
"Turbulence Modeling for Separated Flows"

William Denman
University of Cambridge, United Kingdom
"Formal Methods"

Angel Flores-Abad
New Mexico State University, United States
"Dynamics and Control"

Stephen Gill
University of Bristol, United Kingdom
"Stability and Bifurcation Analysis of the Generic Transport Model"

Victor Guana
University of Alberta, Canada
"Code Generation through Model Driven Engineering"

Min He
Stevens Institute of Technology, United States
"Surface Parameter Retrieval from CALIPSO Data"

Ben Hillery
Brigham Young University, United States
"Software Verification – DiSE Analysis"

Naeem Huque
University of Illinois, United States
"Fracture Mechanics"

Antoni Kopyt
Warsaw University of Technology, Poland
"Human Machine Systems"

Yunlong Liao
University of Puerto Rico, Puerto Rico
"Synthesis and Characterization of Boron Nitride Nanomaterials"

Pierre Neron
INRIA – French Institute for Research in Computer Science, France
"Formal Methods"

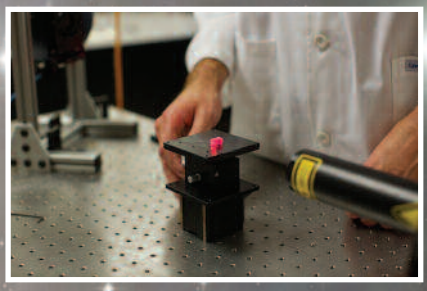
Han-Hsun Lu
National Cheng Kung University, Taiwan
"Dynamics and System Identification of Spinning Membrane"

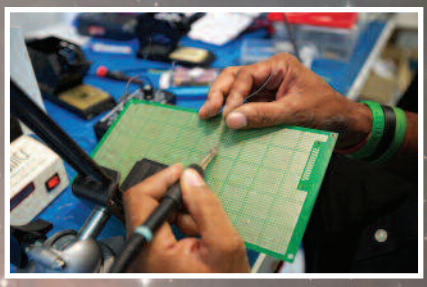
Theodorus Ooijevaar
University of Twente, The Netherlands
"Structural Health Monitoring of Composite Structures"

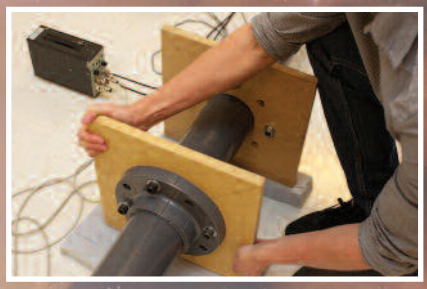
M. Francesca Pernice
University of Bristol, United Kingdom
"Investigation of Damage Mechanisms in Composite Laminates"

Carlos Sarrado
University of Girona, Spain
"Adhesive Analysis in Composite Structures"

Bart Welling
Technische University, The Netherlands
"Material Science"





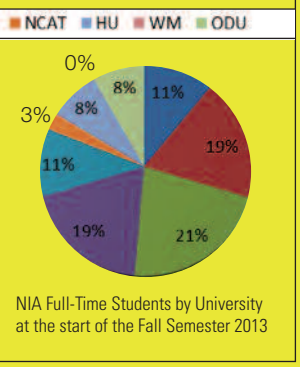


Graduate Education:

The NIA Graduate Program offers M.S. and Ph.D. degrees from the six founding member universities: Georgia Tech, North Carolina A&T State University, North Carolina State University, University of Maryland, University of Virginia, and Virginia Tech, with additional opportunities from Hampton University, Old Dominion University, and the College of William and Mary. In 2013, 37 full-time students were enrolled in our graduate education program. Of these students, 16% were female; 62% were Ph.D. candidates; and 38% were working toward an MS degree. In addition to the full-time students, NIA had 31 part-time students enrolled in the program. Students are technically and geographically diverse.

Full-Time Students

GT	4	11%
UVA	7	19%
VT	8	21%
NCSU	7	19%
UMD	4	11%
NCAT	1	3%
HU	3	8%
WM	0	
ODU	3	8%



NIA Full-Time Students by University at the start of the Fall Semester 2013

2013 Graduate Degrees Available at NIA

NIA has 4 distance learning classrooms to provide a wide range of educational services to our students. Some classes at NIA are taught live, while others involve various synchronous and asynchronous delivery systems. In the Spring 2013 semester, NIA offered 119 classes to students; 114 classes were available during the Fall 2013 semester. Since the first graduates in 2004, 144 students have graduated from this unique program where students can earn engineering and science degrees from one of our prestigious universities.

Member University	Degree Programs Offered
Georgia Tech	Aerospace Engineering
Hampton University	Planetary and Atmospheric Sciences *
North Carolina A&T State University	Mechanical, Electrical and Computer Engineering
North Carolina State University	Mechanical and Aerospace Engineering
Old Dominion University	Aerospace Engineering
University of Maryland	Aerospace Engineering
University of Virginia	Mechanical and Aerospace Engineering; Electrical and Computer Engineering; Materials Science and Engineering; Engineering Physics; Systems and Information Engineering
Virginia Tech	Aerospace, Mechanical, or Ocean Engineering; Materials Science and Engineering; Engineering Mechanics; Electrical and Computer Engineering; Computer Science
William and Mary	Applied Science *

*Courses typically available on campus only.

Martin L. Drews Memorial Scholarship

The 2013 Martin L. Drews Memorial Scholarship was awarded to Duncan A. McGillivray, a University of Virginia Ph.D. candidate studying Electrical and Computer Engineering at the National Institute of Aerospace. The supplemental scholarship is intended for a student who is engaged in research related to the exploration of space. Duncan McGillivray is the sixth recipient of the scholarship.

2013 Graduates

Erik Lee Axdahl

Georgia Institute of Technology/December 2013 Ph.D., Aerospace Engineering, Dr. Alan Wilhite
Thesis Title: A Study of Premixed, Shock-Induced Combustion with Application to Hypervelocity Flight Present Position: NASA/LaRC – Civil Servant in Hypersonic Airbreathing Propulsion Branch

Brett Frederick Bathel

University of Virginia/August, 2013
Ph.D., Mechanical and Aerospace Engineering, Dr. Christopher Goyne
Thesis Title: Application of Molecular Tagging Yelocimetry to Study Laminar Flow and Laminar – to-Turbulent Transition in Hypersonic Boundary

Sean Currey

Georgia Institute of Technology/May 2013
M.S., Aerospace Engineering, Dr. Alan Wilhite
Thesis Title: Optimum Thrust to Weight Ratio for an Earth Departure Stage Using Particle Swarm Optimization Present Position: SpaceX in Thermal Dymamics, California

John M. Gregory

Old Dominion University/August 2013
M.S., Aerospace Engineering, Dr. Colin Britcher
Thesis Title: Design Advantages of Skin Friction Drag Reduction Using Riblets Present Position: Engineer, Defense Contract Management - CT and pursing Ph.D. though Colorado State University

Michelle Jones

Virginia Tech/May 2013
M.E., Mechanical Engineering, Dr. Walter O'Brien
Thesis Title: Turbomachinery and Thermodynamics Present Position: NASA/LaRC Aerothermodymamics Branch

Derek Liechty

University of Maryland/May 2013
M.S., Aerospace Engineering, Dr. Mark Lewis
Present Position: NASA/LaRC Civil Servant

Ben Phillips

Old Dominion University/December, 2013
M.S., Aerospace Engineering, Dr. Colin Britcher
Present Position: Continuing on for Ph.D.

Michael Polanco

Old Dominion University/December 2013
M.S., Aerospace Engineering, Dr. Sebastian Bawab
Thesis Title: Examination of Micromotion-Induced Transient Effects of Brain Tissue Interfaced with a Neural Probe Present Position: Continue working at Eagle Technologies LLC

Eric Ragan

Virginia Tech/May 2013
Ph.D., Computer Science, Dr. Doug Bowman & Dr. Kathryn Logan, Retired
Thesis Title: Supporting Learning through Spatial Information Presentations in Virtual Environments Present Position: Oak Ridge National Laboratory, Research Scientist

Shane Seaman

Virginia Tech/May 2013
M.E., Electrical Engineering, Dr. Randy Heflin
Thesis Title: Earth Observation Satellite optical System Design Present Position: Continuing on in NIA program for Ph.D.

Matthew Smith

Virginia Tech/December 2013
M.S., Aerospace Engineering, Dr. Chris Fuller
Present Position: Boeing, Guidance, Navigation, and Control Engineer

Kurt Swieringa

Georgia Tech/May 2013
M.S., Aerospace Engineering, Dr. Amy Pritchett
Present Position: NASA/LaRC

Mark Thornblom

University of Maryland/May 2013
M.S., Aerospace Engineering, Dr. David Akin

Kenneth Toro

Old Dominion University/August, 2013
M.S., Aerospace Engineering, Dr. Drew Landman
Thesis Title: Development and Assessment of an In-situ Load System Present Position: NASA/LaRC – PT employee in Aeronautics System Engineering Branch and continuing studies towards Ph.D. at ODU

Jake Tynis

Old Dominion University/May 2013
M.S., Aerospace Engineering, Dr. Robert Ash
Present Position: Engineer, Schafer Corporation

Continuing Education

NIA recognizes the importance of continuing and lifelong learning for all individuals engaged in technical fields of study. We also understand that the education and training needs of engineers and scientists established in their fields often differ from those of individuals entering the field for the first time. For those seeking to enhance and expand their knowledge in focused fields, NIA has developed a program of short courses, workshops, conferences, seminars, and colloquia. In 2013, NIA offered more than 57 seminars, 4 workshops and 4 short courses. A number of our short courses are open to NASA and the general public and some of the seminars are video recorded and web-archived on the NIA web site.

NIA Students from University of Virginia Win National Wheelchair Competition

NIA/UVA students Dennis Waldron, Duncan McGillivray, Craig Ungaro, and Ankit Shah won first place in the 2012 World Cerebral Palsy Day "Change My World in One Minute" Competition for their design of a solar-powered wheelchair with retractable panels. The wheelchair concept was inspired by the design of retractable roofs on convertible cars. The wheelchair can operate for more than 4 ½ hours at a speed of 5 mph on a fully charged battery, a range increase of more than 40 percent over batteries alone. The students' advisor is Dr. Mool Gupta, UVA Langley Professor at NIA.

NIA Students from Georgia Tech Win "Best Space History, Society and Policy Paper" at AIAA Space 2013 Conference and Exposition

NIA/GT students Christopher Jones Patrick Chai, and Sean Currey from Georgia Tech won the 2013 Conference award for the "Best Space History, Society and Policy Paper" at this year's AIAA Space 2013 Conference and Exposition held in San Diego, CA. In the paper, the students reviewed NASA's space exploration plans beyond low Earth orbit and identified discontinuity between exploration visions and the resulting programs. The paper also surveyed the success of the Apollo program and the lesser results of recent exploration plans. The team's advisor is Dr. Alan Wilhite, Georgia Tech Langley Professor at NIA.

Outreach

Educational Outreach

NIA's team of STEM education specialists, Educators-in-Residence and program managers work closely together and with our customers to develop and deliver signature national and regional programs to advance STEM literacy and inspire the next generation of scientists and engineers.

Our award winning outreach covers the continuum of education – from the young to the young at heart – through programs that capture early fascination with science, technology, engineering and math; feed that interest through the formative years; and share exciting discovery and innovation to public audiences across the nation.

- **Teacher training through pre-service and in-service teacher professional development**
- **K-12 student engagement through formal and informal integrative STEM learning programs**
- **University student engagement through internships and rigorous engineering challenges**
- **STEM literacy and awareness through national radio, web-based, and television programming**

K-12 Educator Programs and Classroom Resources

CENTER FOR INTEGRATIVE STEM EDUCATION
NATIONAL INSTITUTE OF AEROSPACE

NIA's Center for Integrative STEM Education focuses on the unique needs of the K-12 formal and informal STEM learning community. Started in 2012, it has grown in reputation and reach providing dozens of successful state and national programs to school districts, local, state and federal government and industry.

Graduate Courses in Elementary STEM

NIA develops and delivers a five-course graduate series in Elementary STEM in partnership with McDaniel College. Practical Applications, STEM Education Roots, Trends and Issues, Methods and Materials, and Lesson Studies are all taught through a hybrid delivery of face-to-face and asynchronous on-line classes. These contracted courses to school districts are customized to meet each district's curriculum, and include job-embedded projects and activities for the participants.

NIA educators facilitated more than

80 Educational outreach events during 2013, impacting more than **2,500** formal and informal educators and **4,000** students.

PST

NASA-NIA Integrative STEM Pre-Service Teacher Institute

NIA educators developed and delivered the 2013 Pre-Service Teacher Institute to 23 university students preparing for teaching careers in the K-8 classroom. During the week-long program, participants were immersed in inquiry learning with a focus on real-world connections and the design of authentic integrative STEM lessons into standards-based curriculum. NASA's portfolio of educational resources was paired with 21st century learning skills and instructional technology to engage participants in NASA-based STEM education. Through a series of engineering design challenges and interactions with NASA engineers and scientists, the participants experienced engineering design in action and learned how design challenges exemplify best practices and align with the Next Generation Science Standards. www.nianet.org/pstsp

NASA eClips™

NASA eClips™ is an award-winning national educational program developed to inspire and engage K-12 students by helping them see real-world connections to STEM education. Short, relevant video segments and educator materials offer unlimited flexibility in the classroom for timing, sequencing, and pacing of instruction to meet the needs of students and classroom instructors. All NASA eClips™ products are aligned with current national curriculum standards as identified by the National Council of Teachers of Mathematics, the National Science Teachers Association (NSTA) and the International Society for Technology in Education.

Addressing the new engineering standards, NASA eClips™ provides material for teachers to integrate engineering practices into core subjects.

Eleven (11) new NASA eClips™ segments were produced for NASA in 2013 featuring Earth Science and Planetary Science content. Related NASA resources are continuously aligned with video segments and posted on the NASA eClips website and social media outlets. www.nasa.gov/nasaeclips

The RealWorld-InWorld NASA Engineering Design Challenge

The RealWorld-InWorld NASA Engineering Design Challenge is a unique education initiative for students to explore and to build skills essential for successful STEM careers through two phases of project-based learning and team competition. In the RealWorld phase, teams of 8-12 grade students and teachers/coaches work face-to face collaboratively as engineers and scientists. After exploring and designing solutions in the RealWorld phase, participants move In World to continue working in a 3D virtual universe. In this virtual environment, each newly-formed team uses 21st Century tools to refine designs and to create 3D models related to a specific NASA real-world challenge. The Challenge is a collaboration between NASA, NIA, and USA TODAY Education.

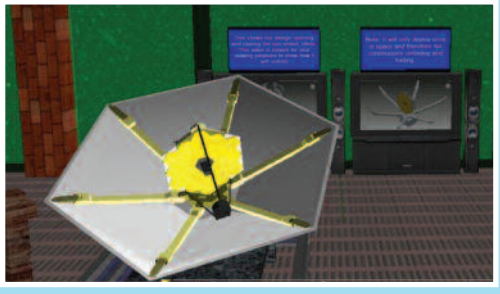
During Spring 2013, participating students completed the third year's challenges focusing on the James Webb Space Telescope. NIA Educators facilitated virtual "chats" between Webb engineers and "InWorld" participants throughout the challenge. The winning team visited NASA's Goddard Space Flight Center and made presentations to James Webb Space Telescope researchers. http://www.nasarealworldinworld.org

SpaceMath@NASA

In 2013, Dr. Sten Odenwald, an astrophysicis researcher with a passion for STEM, joined NIA's Center for Integrative STEM Education team as the Principal Investigator for SpaceMath@NASA. SpaceMath@NASA produces one-page problems featuring a NASA discovery or engineering issue. The problems are designed for direct classroom use by students and teachers in grades 3 through 12, and use authentic, on-grade-level math topics rooted in real-world science and engineering data. SpaceMath@NASA was developed to help NASA missions upgrade their education and public outreach offerings by explicitly integrating mathematics problems into the science content.

Problems are commonly extracted from NASA press releases and written to feature some surprising but quantifiable aspect of an image or discovery that can be paraphrased as mathematical problems. These can be as diverse as a problem on fractions and percentages using Kepler exoplanet data, or as complex as determining the volume of Comet Hartley-2 using integral calculus.

SpaceMath@NASA regularly receives over 35,000 visitors a month, and has had over 8 million downloads since its inception in 2003. Support for SpaceMath comes from NASA's Science Mission Directorate.
http://spacemath.gsfc.nasa.gov



RealWorld-InWorld NASA Engineering Design Challenge

University Internships and Design Competitions

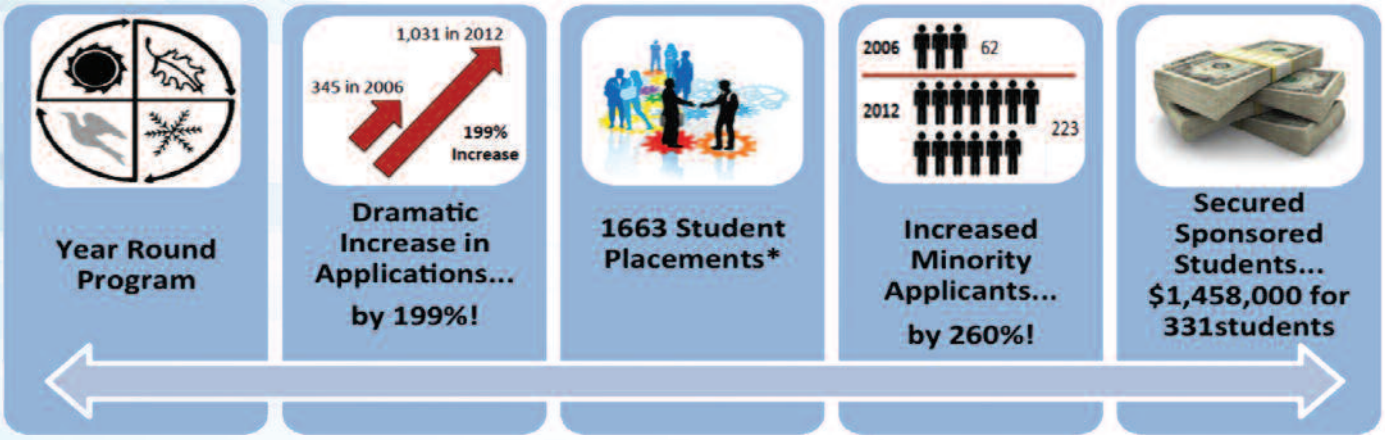
LARSS intern, Carolyn Roberts from Virginia Polytechnic Institute and State University, preparing for an experiment

Langley Aerospace Research Student Scholars (LARSS) Program

The LARSS Program celebrated its 27th Anniversary in 2013 and had another record year with 260 student internships placed at Langley Research Center. LARSS, a highly competitive research internship program, targets undergraduate and graduate students pursuing degrees in science, technology, engineering, and math (STEM), as well as fields relevant to work conducted at NASA Langley Research Center. Designed to bridge the gap between academic concepts and real-world experience, LARSS offers students studying STEM disciplines the opportunity for research, academic engagement and collaboration with NASA's professional STEM work force. LARSS helps students become "work ready" by emphasizing STEM competencies and building 21st century skills. LARSS is a year-round paid internship program with 3 sessions – fall and spring (15 weeks) and summer (10 weeks).

The LARSS Program is managed for NASA by NIA and implemented by the Virginia Space Grant Consortium under a sub-award.

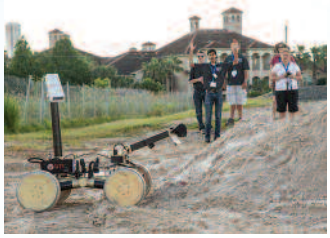
Between 2006 and 2013, LARSS has exceeded goals:



Revolutionary Aerospace Systems Concepts - Academic Linkage (RASC-AL)

RASC-AL is an annual undergraduate and graduate level engineering design competition, managed by NIA for NASA. The competition focuses on human scale architecture and systems. This year's Forum was held in Cocoa Beach, Florida in June 2013. Sixteen university teams competed for top honors for mission architecture design relevant to NASA's current human space exploration program goals.

The steering committee, comprised of NASA and industry experts, scores and judges all aspects of the competition including abstracts, technical papers, oral presentations, posters and education/public outreach activities against a list of criteria and constraints announced at the onset of each year. In 2013, Virginia Tech garnered first place and University of Maryland placed second. www.nianet.org/RASCAL



RASC-AL Exploration Robo-Ops

Robo-Ops is a university level engineering design competition focused on robotics systems, managed by NIA for NASA. University teams vied for one of 8 slots to demonstrate their rover's capabilities by performing a series of tasks in field tests at NASA Johnson Space Center's (JSC) Rock Yard. Rovers are operated remotely from the mission control center of their home universities, while remaining team members join the rover at the JSC Rock Yard to serve as the team's on-site pit crew. This robotic manipulation, complete with communication delays, replicates how robots and astronauts will work together in the near future on human space exploration missions. Student teams are also required to submit a technical paper and poster, as well as conduct a robust and dynamic education and public outreach component that demonstrates participatory exploration approaches for future NASA missions. University of Massachusetts, Lowell claimed first price, and the University of Maryland finished in second place in the 2013 competition. www.nianet.org/RoboOps

Media Communications and Public Outreach

NIA collaborates with government, industry, universities, professional societies, non-profits and others to develop and implement projects and campaigns that build excitement and support for NASA and the aerospace community.

NIA's multi-layered support and world-class creative services are crafted to deliver award-winning campaigns. With internationally recognized work in television, radio, web, live broadcasts, conferences, and events, NIA provides multi-layered support and world-class creativity for marketing and media, outreach and communications.

NIA's web broadcasting efforts in 2013 surpassed more than 3 million viewer minutes with audience from around the globe.

In 2013, the NIA Media Communications Group received two Telly Awards and a National Capital Chesapeake Bay Regional Emmy Award for NASA 360: *Robots, Rocks and Rovers*.

NASA 360

Designed to air on public television and on NASA.gov, NASA 360 is a premiere NASA outreach program that engages an adult (18-35) audience. The program highlights NASA's current research projects and informs and educates us on ways to conserve and sustain life on Earth, while looking ahead to life in our solar system and beyond. 2013 episodes included Return of the Rovers and Stories of the Solar System.

NASA 360 has more than 15 million downloads from NASA.gov and millions of Facebook and Twitter followers. NASA 360 is available on public and commercial broadcast stations, including NASA TV, and airs on Hulu and international airline flights.

www.nasa.gov/nasa360

INNOVATION NOW

2013 Winner of the Communicator Award of Distinction for National Radio Campaign, Innovation Now was developed in collaboration with NASA Langley Research Center and launched in Sept. 2011. NIA produces and distributes ~ 260 radio segments annually. The 90-second interstitials are designed to air daily, Monday-Friday, for broadcast during programs like National Public Radio's "All Things Considered." WHRO/WHRV Hampton Roads is the public radio partner supporting online distribution of the program nationally to public radio stations.

The series reaches ~7 million listeners daily via pubic, college and commercial broadcast radio stations, on the web and through mobile devices. Innovation Now's geographic footprint currently reaches every U.S. state, Australia, Thailand, the Philippines, and New Zealand.

www.innovationnow.us

NASA Exploration Design Challenge (EDC)

NASA EDC was developed in collaboration with Lockheed Martin and NASA and is an opportunity for students to chart their journey to deep space by tackling one of the major challenges of long-duration exploration – the dangers associated with radiation. The challenge is open to students in grades K-12 and culminates with the launch of Orion's Exploration Flight Test–1 (EFT-1) in December 2014.

Elementary and middle school students are encouraged to design and test common materials that might block simulated radiation. High school students have the opportunity to design an actual shielding experiment that could be flown on EFT-1. All students who complete the challenge before June 30, 2014, may have their names flown on EFT-1 as the virtual crew for the historic flight. www.nasa.gov/education/edc

Live Streaming and Event Support

In 2013 NIA collaborated with NASA, the commercial aerospace industry and non-profit organizations to increase awareness and participation of the public for numerous high-profile events, series and conferences including:

- SPACEUP Houston
- 44th Annual Lunar Planetary Science Conference
- AAAS Science Meets Arts: Images of our Solar System
- IAA Planetary Defense Conf.
- Heads Up! The Origins of Comets
- Humans 2 Mars Summit
- Comet ISON Workshop
- 51st AIAA Aerospace Sciences Meeting Including the New Horizons Forum and Aerospace Exposition
- 9th AIAA/ASME/SAE/ASEE Joint Propulsion Conference & Exhibit and 11th International Energy Conversion Engineering Conference
- 2013 AIAA Aviation
- AIAA SPACE 2013 Conference & Exposition
- Annual International Space Station Research & Development Conference

In 2013 NIA received 2 NASA Exceptional Achievement Outreach Team Awards for events supporting NASA's coverage of the Venus Transit and Curiosity's Landing on Mars.

The National Institute of Aerospace (NIA) is a non-profit research and graduate education institute created to conduct leading-edge aerospace and atmospheric research, develop new technologies for the nation and help inspire the next generation of scientists and engineers.

A quality team is essential to the success of NIA's research and educational programs. The NIA team consists of 204 highly educated and qualified research scientists and engineers, education specialists, students, and program and operational support staff. NIA's research staff includes research scientists and engineers ranging from post-doctoral to senior research fellows. Among the research staff, 84% hold doctoral level degrees in fields related to aerospace. Our researchers are sought-after experts in their fields and present their research to others through conferences, seminars, workshops, and publications.

Mission

Our Vision

"To be a recognized leader in innovative aerospace research, exemplary education, and inspirational outreach."

Our Mission

Lead and conduct synergistic research with government, academia and industrial partners to stimulate innovation and creativity

- **Deliver** unique, collaborative, and comprehensive graduate and continuing education in science and engineering
- **Inspire** the next generation of aerospace engineers and scientists and provide outreach for the public good
- **Incubate** and commercialize new intellectual property developed through NIA's research activities

Our Objectives

- **Establish** collaborative research and education centers that are internationally recognized for important intellectual contributions in aerospace-related engineering, science, and technology.
- **Remain** strategically aligned with NASA Langley and respond to NASA's research and development, education, and outreach priorities as they evolve.
- **Develop** and grow non-NASA support for research, education and outreach programs, including a robust collaborative research program with the global aerospace industry.
- **Collaborate** closely with university partners in fulfilling NIA's vision
- **Attract** the highest quality researchers, faculty, and students to conduct a collaborative, multi-disciplinary education and research program

Our Values

- Our people are our strength
- Dedication to every stakeholder's success through excellent service
- Innovation in research and education that impacts future generations
- Trust and accountability in all relationships
- We share one vision and act as one Team
- We embrace change and reward innovation

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