NIAR

CAPABILITIES GUIDE

&

2010 ANNUAL REPORT

NATIONAL INSTITUTE FOR AVIATION RESEARCH
Dear Colleagues,

As the aviation industry continues its slow economic rebound, the National Institute for Aviation Research (NIAR) at Wichita State University (WSU) is proud to report a record-breaking year in terms of funding.

NIAR’s fiscal year ended in July 2010 with total funding of $45.4 million. This number indicates that our clients in the aviation manufacturing industry are focusing on research and development, and the key role research and development plays within economic recovery. This strategy is not solely recognized by industry, but also by our state and federal government.

In fiscal year 2010, NIAR received 49% of its funding from private organizations for research, development, testing and certification services. Federal organizations, including the Federal Aviation Administration, the U.S. Air Force, the U.S. Navy and the National Aeronautics and Space Administration, accounted for 37% of NIAR’s research contracts, and 11% (around $5 million) was provided by the State of Kansas to support research programs selected by local aviation industry representatives in the NIAR/Industry/State program.

I would like to thank the Kansas State Legislature and the Kansas Congressional leadership for their continued support of NIAR programs. I would also like to thank the City and County government and aviation industry for their support of the new National Center for Aviation Training (NCAT) in Wichita.

NCAT is a world-class aviation training facility aimed at providing industry-driven workforce training for the aviation industry. The center is managed and operated by Wichita Area Technical College. NIAR has partnered with the technical college to increase the training opportunities available at NCAT. For more information about NCAT see page 29 or visit ncatkansas.org.

New and expanded programs for 2011 include the addition of the Metrology Laboratory, which provides calibration services for test and measurement equipment; expansion of the Environmental Test Laboratories; and addition of the Advanced Coatings Laboratory and aerospace coatings and paint technology curriculum at NCAT. See page nine for more information on these programs, directed by industry professional Brandon Hunt.

In 2011, NIAR’s established laboratories will continue to offer services in friction stir welding, aging aircraft, CAD/CAM, composites and advanced materials, computational mechanics, crash dynamics, full-scale structural testing, mechanical testing, virtual reality and aerodynamics. Detailed capabilities, updates and contact information for these laboratories are all included in this year’s report.

John Tomblin, Ph.D
Executive Director, NIAR
Sam Bloomfield Distinguished Professor of Aerospace Engineering

LEFT: Andy Schlapp, Executive Director, Government Relations and Board of Trustees, WSU; John Tomblin; U.S. Sen. Jerry Moran; Donald L. Beggs, President, WSU; and Gary Miller, Provost and Vice President, Academic Affairs and Research, WSU, during a press conference held at the National Institute for Aviation Research in October. RIGHT: John Tomblin leads a tour of NCAT for Sedgwick County Commissioners Dave Unruh and Tim Norton and John Fernandez, Assistant Secretary of Commerce, U.S. Economic Development Association.
Funding Profile

Yearly Funding (in millions)


Federal 37% Industry 49%

KTEC 1% University 2%

Aviation Research 11%
NIAR provides research, development, testing and certification services to the aviation community and beyond.

NIAR employs nearly 350 full- and part-time employees. NIAR’s full-time staff of 200 includes 60 Ph.D.s, 35 master’s degrees and 105 bachelor’s degrees.

In the past ten years, NIAR has nearly tripled its yearly funding, with $45.4 in 2010.

According to National Science Foundation data, Wichita State University ranks fourth among all U.S. universities in aeronautical R&D expenditures due to research performed at NIAR.

NIAR has four locations in Wichita and a CAD/CAM training facility in Newport Beach, California.

NIAR’s Composites & Advanced Materials Laboratory performs a large majority of the FAA’s composites research programs.

IN 2010

NIAR celebrated its 25th anniversary.

The Advanced Joining & Processing Laboratory successfully performed friction stir welding using an ABB IRB-6600-175 robot.

NIAR offered its first online Composites Maintenance Technology Course.

NIAR and Hawker Beechcraft (HBC) extended their strategic partnership. NIAR gained facilities at HBC to offer additional services in environmental testing and metrology.

The Walter H. Beech Wind Tunnel performed low-speed wind tunnel tests for the Learjet 85 and the world’s fastest woman on two wheels, among many others.

NIAR’s CAD/CAM, Composites, Nondestructive Testing and Advanced Joining & Processing Laboratories moved to the new National Center for Aviation Training.
NIAR’s laboratories and research programs are tailored to meet the needs of the Wichita aviation industry, but our reach is global. From small start-up organizations to large established international companies; from Texas to the Netherlands; our labs provided services to each of the following organizations in fiscal year 2010.

AAR Composites Clearwater, FL
ACCRAbond Inc. Olive Branch, MS
ACT Aerospace Gunnsion, UT
Aero-Mach Labs Inc. Wichita, KS
Aerospace Manufacturing Corp. Fredonia, KS
Aerospace Systems & Components Inc. Wichita, KS
Aerospace Technologies Group Boynton Beach, FL
AeroVironment Inc. Simi Valley, CA
AGCO Corporation Hesston, KS
Airbus North America Engineering Inc. Wichita, KS
Albany Engineered Composites Rochester, NH
AMETEK Advanced Industries Inc. Wichita, KS
AnemErgonics LLC Arvada, CO
AORC Lexinton, KY
Applied Composite Technology Fayette, UT
ARCCA Inc. Penns Park, PA
Arizona Paradogue Systems Kingman, AZ
ATK Alliant Techsystems Inc. Plymouth, MN
Aviation Consulting & Engineering Solutions Wichita, KS
B/E Aerospace Wellington, FL
The Boeing Company Seattle, WA
Bombardier Aerospace Montreal, Quebec, Canada
Burnham Composites Inc. Wichita, KS
Cessna Aircraft Company Wichita, KS
CIBOR Inc. Wichita, KS
Cirrus Design Corp. Duluth, MN
CSI Aerospace Inc. Broken Arrow, OK
Cytec Engineered Materials Valley Center, KS
Dassault Systemes Services LLC Charlotte, NC
Diamond Aircraft Ontario, Canada
East/West Industries Inc. Ronkonkoma, NY
The Engineering Institute LLC Farmington, AR
Fairmount Technologies Wichita, KS
Fiber Dynamics Inc. Wichita, KS
Flint Hills Solutions LLC Augusta, KS
Galtronics Corporation Tempe, AZ
Garmin International Ltd. Olathe, KS
General Atomics Aeronautical Systems San Diego, CA
GKN Aerospace Service Hazelwood, MO
Great Plains Industries Inc. Wichita, KS
Greene, Tweed & Company Kilpsville, PA
Gulfstream Aerospace Corporation Savannah, GA
Harley Davidson Motor Co. Wauwatosa, WI
Hawker Beechcraft Wichita, KS
Hexcel Corporation Wet Valley City, UT
Honda Aircraft Company Greensboro, NC
Kaman Aerostructures Inc. Wichita, KS
Kelly Manufacturing Co. Wichita, KS
Learjet Wichita, KS
Lee Air, Inc. Wichita, KS
Liberty Aerospace Melbourne, FL
Lockheed Martin Corp. Lakeland, FL
Metal Improvement Company Livermore, CA
Mid-Continent Instruments Wichita, KS
Millennium Concepts Inc. Wichita, KS
MILTEC Corporation Huntsville, AL
NASA Goddard Space Flight Center Greenbelt, MD
Naval Surface Warfare Center West Bethesda, MD
Newport Adhesives and Composites Inc. Irvine, CA
The Nordam Group Tulsa, OK
Northrop Grumman Corporation San Diego, CA
Oceaneering International Inc. Panama City, FL
Orthopaedic Research Institute Inc. Wichita, KS
Otto Engineering Carpenterville, IL
Park Aerospace Materials Corp. Fullerton, CA
Polaris Industries Inc. Roseau, MN
Pratt-Miller Engineering New Hudson, MI
Radiance Technologies Huntsville, AL
RCO Engineering Inc. Roseville, MI
RECARO Aircraft Seating Inc. Fort Worth, TX
Regent Aerospace Corporation Valencia, CA
Rocky Mountain Composites Inc. Spanish Fork, UT
Royal Plastic Mfg. Inc. Minden, NE
Saratech Inc. Dana Point, CA
Seats of Australia PTY. LTD Victoria, Canada
Shadowfax, LLC Rancho Santa Fe, CA
Sikorsky Aircraft Stafford, CT
Spirit AeroSystems Inc. Wichita, KS
Stratasys Eden Prairie, MN
TASS-SAFE Delft, Netherlands
TENCATE Advanced Composites Inc. Morgan Hill, CA
Toho Tenax of America Rockwood, TN
Toray Composites America Inc. Tacoma, WA
Universal Lubricants LLC Wichita, KS
University of Kansas Lawrence, KS
US Army Redstone Arsenal, AL
USB FireWire/RR Business Ventures LLC Wichita, KS
Valdez International Corporation Colorado Springs, CO
Wichita Area Technical College Wichita, KS
Work Force Alliance Wichita, KS
Zodiac Aerospace Provo, UT
Zoltek St. Louis, MO
The National Institute for Aviation Research (NIAR) is an unincorporated division of Wichita State University. NIAR reports to the Office of Academic Affairs and Research through the associate provost Dr. David McDonald. NIAR Executive Director Dr. John Tomblin oversees 350 employees, fifteen laboratories, six support laboratories and four centers within the Institute.
NIAR takes advantage of its location in the “Air Capitol of the World,” through the Executive Industry Advisory Council. This group of senior level management from Boeing Integrated Defense Systems, Bombardier Learjet, Cessna, Hawker Beechcraft and Spirit AeroSystems provides NIAR researchers with input from key players in the local aviation industry. The information offered by these individuals helps outline and prioritize future research topics, equipment updates and laboratory additions.
The Advanced Coatings Lab opened in 2010 to expand NIAR’s materials science capabilities. The lab is located at the new National Center for Aviation Training and specializes in research, development, and testing of aerospace coatings.

**CAPABILITIES**
- New coatings technology research and development
- Customized formulation of interior and exterior high performance coatings
- Materials/process evaluation and optimization
- Coatings application process improvement
- Product testing to military, OEM, and industry specifications
- Workforce Development

**PROJECTS**
- Materials for EMI Protection of Composite Airframe Structures – Development of Conductive Coatings System (U.S. AFRL)
- Non-chrome primer evaluations

**EQUIPMENT**

**Test Chambers**
- Salt Fog Cabinet
- Temperature/Humidity Chamber – Exposure Testing, Filiform Corrosion
- Accelerated Weathering Units – Xenon, QUV
- Low Temperature Freezer

**Physical Testing**
- Impact testers – Standard and G.E.
- Abrasion tester
- Mandrels for flex testing – standard and conical
- Adhesion Test Kits
- Water Immersion Bath
- Dry Film Thickness – Magnetic Induction, Eddy Current, Ultrasonic
- Hardness - Pencil

**Color and Appearance**
- Spectrophotometer – Desktop, Handheld
- Multi-Angle Spectrophotometer – Effect Pigment Evaluation
- Gloss Meter
- Orange Peel/DOI Measurement Unit
- Light Booth
- Microscope
- Rheology
- Viscosity Cups
- Brookfield Viscometer
- Stormer Viscometer

**Application**
- Automated Panel Sprayer
- Gravity Feed Spray Guns – HVLP, Compliant
- Pressure Feed Spray Guns – HVLP, Compliant
- Pressure Pots

**Surface Preparation**
- Central Dust Collection System
- Sanders
- Buffers/Polishers
- Easily Manipulated Mechanical Arm Units – Temple Allen

**CONTACT**
Brandon Hunt, Director  
brandon.hunt@niar.wichita.edu  
(316) 677-1334

www.niar.wichita.edu/advancedcoatings
In 2010, the Advanced Joining & Processing Lab relocated to the new National Center for Aviation Training (see pg. 29). The lab is currently developing materials specifications and utilizing robotics for friction stir welding (FSW), friction stir processing and friction stir spot welding.

CAPABILITIES
• Multiple joint configuration including butt and lap joints
• Joining of any aluminum alloy from 0.020 in. to 1 in. thick
• Joining and processing high temperature metals such as nickel-aluminum-bronze, steel and titanium
• Prototype development and pilot production
• Complex curvatures or linear weld paths up to 10 ft. long
• Material and structural testing and analysis of structures
• Multi-axis FSW research and development
• Self-reacting and retractable pin
• Corrosion testing
• Automatic microhardness testing/mapping
• Metallography, mechanical testing and analysis
• Friction stir spot welding
• Software development and control for robotic applications
• Advanced non-destructive evaluation methods for FSW

PROJECTS
• Path Independence of Friction Stir Welding
• Design Data for In-Situ Integral Fasteners
• Development of Friction Stir Welded Structure for Laser Peening
• Mechanical and Microstructural Evaluation of Joined Titanium Structures
• Computer Modeling and Distortion Control
• Standards and Specifications for Friction Stir Processing & Welding
• National Science Foundation I/UCRC – Center for Friction Stir Processing

EQUIPMENT
• MTS ISTIR PDS 5-axis motion, 7-axis force monitoring friction stir welding machine, 120-inch x 40-inch x 25-inch work envelope
• Kawasaki ZZX-200S robot with FSJ C-frame
• ABB IRB-6600-175 robot with Friction Stir Link C-frame
• ABB IRB-7600 robot with High Rotational Speed Spindle
• 22-kip load frames Leco AMH-53 automatic microhardness tester
• Microscopes with digital imaging
• Metallographic sample prep lab

CLIENTS
Boeing, Bombardier Learjet, Cessna, Embraer, General Motors, Gulfstream, Hawker Beechcraft, Manufacturing Technology Inc, Moore Fans, NASA, Spirit AeroSystems

CONTACT
Dwight Burford, Ph.D., Director
dwight.burford@wichita.edu
(316) 978-3204

www.niar.wichita.edu/advancedjoining
The Aging Aircraft Lab supports the federal government and the aviation industry with investigations into the effects of age on commercial and military aircraft.

**CAPABILITIES**

**Assessment of Aging Aircraft Structures through:**
- Large-Scale Extraction
- Precision Detailed Disassembly
- Chemical Coatings Removal
- Non-Destructive Inspection
  - Close Visual Inspection
  - Fluorescent Penetrant Inspection
  - Eddy Current Inspection (Bolt Hole and Surface Scan)
  - Magneto Optic Imaging Inspection (Eddy Current Technique)
  - Ultra Sonic Inspection (Pulse Echo and Thru Transmission)
- Metallurgical and Fractographic Analysis (Optical and Scanning Electron Microscope)
  - Crack Origins
  - Crack Growth Mechanisms
  - Corrosion Characterization
  - Hardness Testing
  - Chemical Composition Analysis
  - Conductivity Testing
- Finite Element Modeling of Aircraft Structures
- Damage Tolerance Assessment of Aircraft Structures

**PROJECTS**
- KC-135 teardown examination
- C-5A aft crown skin testing, inspection and analysis
- F-16 STA teardown examination
- A-10 BHEC specimen generation
- B-52 landing gear and flight control teardown and inspection
- FAA Metallurgical/ Fractographic Evaluation of Structural Components

**EQUIPMENT**
- 21-cubic ft. dry blast paint stripping booth for removal of organic coatings
- Magnaflux L-10 coil
- Parker Research AC/DC yoke
- Liquid penetrant inspection system
- Magneto optic imaging system
- Staveley workstation
- Nortec 2000S eddy scope
- Sonic 1200 ultrasonic unit
- Meiji Inc 7-45x optical microscope
- Hirox Co. 50-300x optical microscope
- Rene Co. digital optical micrometer
- Joel scanning electron microscope
- Chemical coating removal facility

**CLIENTS**
Federal Aviation Administration, Department of Defense, United States Air Force, Lockheed Martin, Boeing Co., Valdez International Corporation

**CONTACT**
Melinda Laubach-Hock, Director  
melinda.laubach-hock@wichita.edu  
(316) 978-8205

www.niar.wichita.edu/agingaircraft
The CAD/CAM Laboratory offers CATIA and ENOVIA courses at the National Center for Aviation Training and on-site at various manufacturing companies. Non-credit courses are available in addition to courses that carry credit through Wichita Area Technical College and Wichita State University.

COURSES AVAILABLE
- CATIA Basic Concepts
- CATIA Composites
- CATIA Part Design & Sketcher
- CATIA Assembly Design
- CATIA Drafting
- CATIA Wireframe & Surfaces
- CATIA Prismatic Machining
- CATIA Surface Machining
- CATIA Fitting Simulation & Kinematics
- CATIA Functional Tolerancing & Annotation
- CATIA Stress Analysis
- CATIA KnowledgeWare
- CATIA Sheet Metal Design
- CATIA Electrical Space
  Reservation
- CATIA Electrical Design
- CATIA Electrical Harness Design
- CATIA Tubing and Piping
- CATIA Ergonomics
- ENOVIA DMU Viewer
- ENOVIA VPLM Basic Concepts
- ENOVIA VPLM Advanced Concepts
- ENOVIA VPLM Product Design
- ENOVIA VPLM Navigator
- FiberSIM

COURSES IN DEVELOPMENT
- CATIA Reverse Engineering
- Polyworks
- CATIA V6

PROJECTS
- Provide training courses for industry, Wichita State University and Wichita Area Technical College
- Development of course instruction manuals
- V4 – V5 Migration into ENOVIA
- Commercial CATIA work
- Consultation

CLIENTS
- Hawker Beechcraft
- Spirit AeroSystems
- Manufacturing Industrial Technologies
- Center of Innovation for Biomaterials in Orthopaedic Research

PARTNERSHIPS
- CGTech Vericut
- Firehole Technologies
- V5 Engineering

CONTACT
Shawn Ehrstein, Director
shawn.ehrstein@wichita.edu
(316) 978-3283

www.cadcamlab.org
Research engineers and lab technicians in the Composites & Advanced Materials Lab perform lay-up and bonding operations to understand the effects of heat, moisture, contamination and repairs on advanced materials. The lab also has a fully capable machine shop for preparing panels and works directly with NIAR’s Mechanical Test Lab.

CAPABILITIES
- Lay-up
- Material equivalence testing
- Qualification testing
- Fatigue, stress and tension testing
- Mechanical testing/design allowable generation
- Quality assurance testing
- Investigation of adhesive behavior
- Bonded repair
- Damage resistance & tolerance of sandwich panels
- Laminate allowable generation
- Aging studies
- Adhesive characterization of fatigued and damaged bonded joints
- Characterization of composite repair
- Full-scale structural testing
- Multiple environmental chambers and conditioning environments
- Dynamic mechanical analysis units
- Differential scanning calorimetry
- Thermogravimetric analyzer
- Optical microscope with video analysis
- Stereoscope x350 with hand-held inspection unit
- Filament winding machine (4-axis)
- 3 Programmable walk-in ovens (500°F)
- Ultrasonic NDI units to perform pulse and echo and TTU scans with curved panel capability
- RTM resin pumps
- Walk-in freezers (-20°F)
- Lay-up rooms
- Machine shop specialized for composite material processing
- Instron Dynatup 8250 with environmental chamber
- X-ray diffraction meter
- Coordinate measuring machine
- Pheonix 4000 SEM and energy dispersive system
- Thermal shock chamber (-160°F to 500°F)

CLIENTS
Boeing, Cessna, Hawker Beechcraft, Lockheed Martin, Bombardier Learjet, FAA

CONTACT
Tom Aldag, Director of R&D
tom.aldag@wichita.edu
(316) 978-5326

www.niar.wichita.edu/composites
The Computational Mechanics Laboratory provides research focused in the development and application of numerical methods in areas of:
- Crashworthiness
- Injury biomechanics
- Structures
- Numerical optimization techniques
- Virtual product development
- Certification

PROJECTS
- Crashworthiness Certification by Analysis of Composite Structures, Federal Aviation Administration
- Bird Strike Numerical Model Development and Validation, NIAR/Industry/State
- Passenger Protection in Rail Transit Vehicles, Federal Transit Administration
- Evaluation HIII 95th and 5th Percentile ATD for Automotive Applications, American Occupant Restraint Council
- Certification by Analysis of Aircraft Interiors, Federal Aviation Administration

COMPUTATIONAL RESOURCES
- 20 HP 8 Core Workstations (160 Cores)
- HPPC Cluster A: 8 nodes (64 Cores)
- HPPC Cluster B: 2 nodes (64 Cores)
- Data Storage System 16 TB
- Secure Area/Data Access

CONTACT
Gerardo Olivares, Technical Director
gerardo.olivares@wichita.edu
(316) 978-7273

www.niar.wichita.edu/compmech
The Crash Dynamics Lab provides research, testing and certification for transportation seats and restraints systems under dynamic impact conditions.

**CAPABILITIES**
- FMVSS 208
- FMVSS 213
- CMVSS 208
- ECE R94
- Euro NCAP
- IIHS
- OSA

**Code of Federal Regulations**
- Title 14 Part 23.562
- Title 14 Part 25.562
- Title 14 Part 27.562
- Title 14 Part 29.562

**Anthropomorphic Test Dummy Calibration**
- On-site calibration capability for Hybrid II and Hybrid III ATDs
- On-site calibration for accelerometers

**PROJECTS**
- Certification by Analysis - Seat Modeling Techniques
- Evaluation HIII 95th & 5th Percentile ATD for Automotive Applications
- Certification by Analysis - Sled Testing for ATD Validation
- Mass Transit Bus Crashworthiness I and II

**AREAS OF RESEARCH**
- Aircraft occupant protection
- Implementation of child restraints in aerospace applications
- Mass transit occupant safety
- Aircraft component certification

**EQUIPMENT**
- **MTS Model 888.20 servo-hydraulic crash simulator**
  - Nominal force: 2,000 kN (450 kips)
  - Max velocity w/ 1,500 kg; 81 km/h (50 mph)
  - Dynamic response: >150 Hz
  - Acceleration w/ 1,500 kg: 65g
  - Acceleration w/ 1,000 kg: 75g

**Photometrics**
- AOS Technologies S-VIT Imagers
- High-resolution color (800x600)
- 1,000 frames per second (10,000 fps at reduced resolution
- Immediate availability of videos in .avi format

**CLIENTS**
- Aircraft, automotive and military vehicle seat manufacturers, internally funded research centers, crash research centers

**CONTACTS**
- Chad Gadberry, Manager
  chad.gadberry@wichita.edu
  (316) 978-5239
- John Laff en, Director
  john.laff en@wichita.edu
  (316) 978-5481
- Gerardo Olivares, Ph.D., Technical Director
  gerardo.olivares@wichita.edu
  (316) 978-7273

www.crashstudies.org
The Environmental Test Laboratories provide the equipment and technical expertise needed to meet environmental standards regulated by the FAA technical standard orders using RTCA DO-160 certification standards. Our personnel have many decades of combined experience in the field of environmental testing for aviation and other industries.

**CAPABILITIES**
- RF cable insertion loss and VSWR testing
- Radome transmissivity testing
- Hi-pot testing services
- 60kV and 100kV P-Static testing systems
- In-Flight Antenna Patterns
- Aircraft Test Hangar 100x100x30ft, door 75ft X25ft. Integral foam fire suppression system for fueled aircraft testing
- Aircraft Hot Fuel Testing (Weather permitting, 85° F. min.)

**DO-160C through F, G**
- Section 4: Temperature & Altitude
- Section 5: Temperature Variation
- Section 6: Humidity
- Section 7: Shock and Crash Safety
- Section 8: Vibration
- Section 9: Explosion Atmosphere (Category H Only)
- Section 14: Salt Fog
- Section 15: Magnetic Effects
- Section 16: Power Input (Excluding Category D – Abnormal Surge Voltage (DC 270V))
- Section 17: Voltage Spike
- Section 18: Audio Frequency

**EQUIPMENT**
- 20 ft. x 20 ft. semi-anechoic chamber
- 30 ft. x 50 ft. x 25 ft. fully anechoic chamber
- 25 ft. x 17 ft. reverb chamber
- 12,000 lb. vibration table
- Rate table capability of 50 lbs. total weight
- Indirect effects of lightning test system
- 40 kW AC/DC power input test system
- Temperature/humidity/altitude chambers (capability up to 100,000 ft.)
- Large environmental chamber - 12’Wx10’Hx48’L (-40 degrees)
- Salt Fog Chambers

**CLIENTS**

**CONTACT**
Matthew Wills, Manager
matthew.wills@wichita.edu
(316) 978-5776

John Laffen, Director
john.laffen@wichita.edu
(316) 978-5481

www.niar.wichita.edu/environmental
The Full-Scale Structural Testing Lab assesses the structural performance and durability of commercial and military aircraft by performing full-scale and component testing (static, durability and damage tolerance), pressure cyclic testing, hail strike testing and material testing.

CAPABILITIES
- Test load development from supplied aircraft loads
- Test fixture design and fabrication
- Load system design and fabrication
- Strain gage and miscellaneous transducer installation
- Data and load control system development and installation
- Testing services and data handling

R&D, Certification or Qualification
- Full-scale and component testing (static, durability and damage tolerance)
- Pressure cyclic testing
- Hail strike testing
- Material testing

PROJECTS
- Bombardier Learjet LJ200 Full Scale certification testing
- Spirit G250 and G650 Flap certification testing
- Boeing 787 Center Bridge testing
- Hawker Beech Model 4000 Fuselage and Empennage Full Scale DADT testing
- DoD Non Destructive Evaluation Reliability Assessment Tool Development
- FAA and NIS research
- MilTec Structural Health Monitoring Development testing on surrogate C130 Rainbow Fitting

EQUIPMENT
- 4 Load control systems with 280 channels and 13 separate load stations
- Data acquisition systems capable of recording 2,500 channels of data
- Secured data ports for customer data transfer
- ARAMIS photogrammetry system, a 3D deformation measuring system to characterize displacements and strains in components
- CATIA V5 capabilities
- Load cells ranging from 50 lbs. - 200,000 lbs.
- Load frames with stroke and load control for material and component testing up to 200,000 lbs.
- Large durability test base fixtures for rapid development of durability test setup for aircraft up through business-size jets
- Pressure control equipment for fuselage cyclic and static pressure testing including a 6” shop air supply and a stand-alone 655 cubic foot per minute 125 HP air compressor
- Hail gun

CLIENTS
Department of Defense, Boeing Aircraft Co., Spirit AeroSystems, Bombardier Learjet, Lockheed Martin, Sikorsky Aircraft, Hawker Beechcraft, Radiance Technology, Miltec

CONTACT
Tim Hickey, Director
thickey@niar.wichita.edu
(316) 978-8204

www.niar.wichita.edu/fullscale
The Metrology Lab provides calibration services for test and measurement equipment traceable to National Institute of Standards Technology reference materials.

**CAPABILITIES**
In most measurement domains, we can both generate and measure.

- **DC/Low Frequency** to 1000 Volts
  AC/DC (Multimeters, Power Supplies, Oscilloscopes)
- Temperature -70°C to +600°C
  (Digital Thermometers, IR Thermometers, Temperature Sensors)
- RF/Microwave to 26.5 GHz
  (Power Meters, Attenuators, Signal Generators and Analyzers)
- Force 500 lbs to 100,000 lbs
  Tension & Compression (Load Cells)
- Pressure to 10,000 psi Oil & Air
  (Pressure Gauges, Pressure Transducers)
- Vibration 5 Hz to 10 kHz
  (Accelerometers)
- Additional Capabilities in
  Resistance, AC/DC Current, Humidity, Capacitance, Inductance, Power

**EQUIPMENT CALIBRATED**

**Electronic**
- Ammeters
- Capacitance bridges and standards
- Function generators
- Impedance meters
- Inductance bridges and standards

**Radio Frequency**
- Signal generators
- Spectrum analyzers
- Counters
- RF attenuators
- Distortion analyzers

**Temperature & Humidity**
- Digital thermometers
- Dial thermometers
- Relative humidity devices
- Environmental chambers*
- Ovens
- Dry block temperature calibrators
- Temperature controllers
- Temperature and humidity recorders
- Thermocouple and RTD calibrators

**Mechanical and Pressure**
- Force machines**
- Accelerometers
- Load cells
- Scales
- PSI gauges
- Absolutes gauges
- Vacuum gauges
- Air data test sets
- Pressure controllers
- Altimeters
- Air speed indicators
- Rate of climb indicators
- Transducers

**CONTACT**
Don Hansen, Manager
don.hansen@wichita.edu
(316) 978-8240

*Local area only
**Up to 200k lbs

www.niar.wichita.edu/metrology
The Mechanical Test Laboratory provides the highest standards in static and fatigue testing for composites and metals to generate material strength allowables and evaluate material properties.

**CAPABILITIES**
- Static and cyclic testing (ASTM and non-standard)
- Impact drop testing
- Slow-cycle fatigue testing
- High temperature testing to 2500°F
- ASTM/Boeing/SACMA standard testing
- Ability to design and fabricate non-standard test fixtures and perform non-standard tests
- Aging studies
- Damage tolerance of sandwich panels
- Specimen conditioning
- Environmental testing (-200°F to +600°F)
- Full-scale structural testing
- Specimen machining (ASTM and non-standard)
- Strain gauging and specimen QC

**EQUIPMENT**
- 5-kip to 220-kip load frames with environmental testing chambers
- Slow-cycle fatigue machines
- Impact tower
- Laser extensometer
- Multiple MTS displacement instruments (uni-axial and bi-axial)
- MTS high-temperature chamber (up to 2552°F) and high-temperature uniaxial extensometer
- Strain Smart (multichannel strain indicating software)
- Strain calibrators
- Aramis (offers non-contact 3D optical deformation and strain analysis)
- 60,000 in-lb torsion test frame

**PROJECTS**
- Off-axis core shear properties of honeycomb core
- Compression after impact testing to determine environmental knockdown effects (NIAR-Industry-State)
- Fatigue and static testing of titanium and stainless steel materials
- ARAMIS photogrammetry on friction stir welded panels
- ARAMIS photogrammetry on patella inserts for alternate ACL human knee repair

**CLIENTS**
Hawker Beechcraft, Sikorsky Aircraft, NAVAIR, Via Christi

**CONTACT**
Tom Aldag, Director of R&D
tom.aldag@wichita.edu
(316) 978-5326

www.niar.wichita.edu/mechanicaltest
The Research Machine Shop supports research at NIAR, WSU and within the aviation industry. The staff’s intimate knowledge of the wind tunnels and other research tools greatly increases the shop’s value and efficiency.

**EQUIPMENT & FACILITIES**
- 5,000 sq. ft. of shop space
- Mastercam X5 software
- CATIA V5 R19 software
- HAAS TL-3 CNC Lathe 20” DIA. x 60” CC
- HAAS VF-2 five-axis VMC 30” x 16” x 20” travel
- HAAS VF-2 four-axis VMC 30” x 16” x 20” travel
- HAAS VF-4 five-axis VMC 50” x 20” x 25” travel
- FADAL 8030 VMV, 80” x 30” x 30” travel
- HAAS HRT-310, 12” Rotary Table
- HAAS HRS-210, 9” Rotary Table
- Grey Planer Mill 96” x 30” x 30” travel with Bridgeport mill head
- K&T #2 Rotary Head die mill
- K&T K4 Horizontal mill with Bridgeport mill head attachment
- Harding high-speed tool room lathe
- Colchester 15” x 50” lathe with tracer
- South Bend 24” x 100” lathe with tracer
- Thompson surface grinder 12” x 36”
- Wood working machines; cabinet and pattern capabilities
- Welding; mig, stick arc and oxy-acetylene
- Hawkey borescope with Sony video camera/capture

**PROJECTS**
- Full-Scale Structural Testing Lab support
- Lightning strike research support
- Friction stir welding research support
- Beech Wind Tunnel upgrades and support for several tests
- Crash Dynamics Lab upgrades and support for several tests
- Composites and Fatigue & Fracture labs tooling and specimens
- Nordam Transparency Division tooling and specimens
- Aircraft icing research project support
- Support for the Center of Innovation for Biomaterials & Orthopaedic Research (CIBOR)
- Support for Fairmount Technologies

**CONTACT**
Art Porter, Manager
arthur.porter@wichita.edu
(316) 978-3656

www.niar.wichita.edu/shop
The Virtual Reality Center develops applied research and provides technical expertise in PLM/virtual reality and associated technologies for WSU, NIAR, the aviation industry and other non-aviation projects.

**CAPABILITIES**

- **Interactive Virtual Prototyping and Digital Mockup:** Behavioral and KBE simulations for conception and design reviews of any MCAD database
- **Real-Time Engineering Simulation:** Visualization of massive CAE datasets for post-process analysis and certification
- **Immersive Ergonomic Analysis:** Anthropometrical simulation for cockpit, cabin and manufacturing; Visual Ergonomics (Photometric, Colorimetric, Legibility and Readability Analysis)

**EQUIPMENT**

- 1,800 sq. ft. visualization room with seating for 25 active stereo glasses users
- 15 x 7 ft. flat screen with active stereoscopic view and rear projection
- Sensics’ xSight 6123 large field-of-view head-mounted display with 1920x1200@60Hz per eye and 123/45 degrees horizontal/vertical for combined eyes
- DLP HDTV 65” active stereo with two-handed interface Space Grips
- VICON 602 with 10 high-speed cameras for full body optical motion capture/tracking
- Ascension’s Nest of Birds with 4 sensors with extended range transmitter for magnetic motion tracking for head, hands and wand
- Fakespace Lab manipulation gloves and wand
- OPTIS portable gonioreflectometer OMS2 for capture of surface optical properties
- CAD/CAE/VR simulation software including DS CATIA V5, DS 3DVIA Virtools, CEI Ensight Gold, EON Reality, PTC Division Reality, Right Hemisphere’s Deep Exploration
- Photometric-based visual and illumination software simulation: OPTIS SPEOS CAA V5
- Web-based ray-tracing visual simulation: Mental Images’ RealityServer

**PROJECTS**

- Virtual Environment Study involving CATIA to VR, mixed reality, photometric simulation, ECS:smoking
- Immersive design review for AGCO combine cabs
- Immersive Medical Environment for Distributed Intuitive Consultation (iMEDIC) Phase 2, developed with Digital ArtForm for US Army sub-contract
- Visual ergonomics analysis for UAV platform display subsystem - GA-ASI, under sub-contract
- Support of CAE results in immersive environment for NIAR Computational Mechanics Lab
- Technology showcases presented for Hawker Beechcraft, Cessna, Spirit AeroSystems, Boeing IDS, Bombardier Learjet, Airbus North-America and others in non-aviation organizations

**CLIENTS**

AGCO, Digital ArtForms, General Atomics Aeronautical System Inc.

**CONTACT**

Fernando Toledo, Manager
fernando.toledo@wichita.edu
(316) 978-8333

www.niar.wichita.edu/vrc
The National Institute for Aviation Research is equipped to handle a wide variety of aerodynamic testing needs, offering services in model design and production, supersonic wind tunnel testing and subsonic testing in the Walter H. Beech Wind Tunnel.

CAPABILITIES
- Speeds of more than 240 mph
- Real-time data reduction and display
- Active heat exchange
- Flow visualization with multi-camera video recording system and 3-watt laser sheet, smoke, tufts, china clay, etc.
- Engineering technical services available from WSU aerospace engineering faculty including computational fluid dynamics modeling, analysis and wind tunnel model structural analysis
- 9-by-9-inch supersonic tunnel to simulate wind speeds from Mach .9 to Mach 4 for 30-second intervals with 40-minute prep time

EQUIPMENT
- Test section 7’H x 10’W x 12’L
- 2,500 HP fan
- Digital video and still cameras
- Aerotech ATE external balance with several mounting arrangements
- Triumph and Aerotech ATE internal balances and c-strut sting system
- PSI 8400 pressure measurement system with more than 280 channels available

PROJECTS
- Boeing ScanEagle Compressed Carriage UAV
- Learjet 85

CLIENTS
- Business jet, UAS, antenna, and recreational vehicle manufacturers
- Federal grant research

CONTACT
John Laffen, Director
john.laffen@wichita.edu
(316) 978-3569

www.niar.wichita.edu/beechwindtunnel
The Aircraft Design & Manufacturing Research Center (ADMRC) was established in October 1995 as a state/industry/university partnership. Envisioned was a consortium of university and industry partners who, working together, would apply their collective expertise to address the technology needs of aircraft manufacturers and subcontractors.

ADMRC combines the talents and support of Bombardier Learjet, Cessna Aircraft Company, Hawker Beechcraft, Spirit AeroSystems, several small businesses and university researchers from Wichita State University, the University of Kansas, Kansas State University and Pittsburg State University. Together, faculty members and researchers can focus on industry problems in Kansas.

ADMRC, partially funded by the Kansas Technology Enterprise Corporation, is a successful state/university/industry partnership. It is recognized nationally as a model for cooperative research.

**FY 2010 PROJECTS**
- Effect of Cure Temperature Variations on Moisture Absorption and Hygrothermal-Mechanical Properties for Out-of-Autoclave Polymer Composites - B. Minaie / M. Violette, Wichita State University
- Electromagnetic Environmental Concerns for Carbon-Fiber Composite Airframes - M. Ewing, University of Kansas
- Machining of Composite Materials - K. Krishnan, Wichita State University / B. Bahr, California State University - Long Beach

The ADMRC program will conclude on December 31, 2011.

**CONTACT**
Gabrielle Dodosh
gabrielle.dodosh@wichita.edu
(316) 978-5218

www.niar.wichita.edu/admrc
Wichita State University is a research site for the National Science Foundation’s Center for Friction Stir Processing (CFSP). The CFSP is a multi-institutional Industry/University Cooperative Research Center started in October 2004. The center brings together the premier friction stir welding and processing academic institutions in the United States and focuses on addressing the needs of aerospace, aeronautic, energy, military and commercial industries in developing friction stir processing.

The center’s mission is to advance, develop and promote research into the principles and technology of Friction Stir Processing science and engineering through fundamental research, development, education and technology exchange among academic, industry and government entities. It is also the mission of the center to increase the quantity and quality of the professionals prepared to work in the area; to involve the faculty of the universities in research in areas of common interest to sponsors and the universities; and to perform research which will allow global Friction Stir Processing facilities to be competitive in the world economy.

The WSU research site is headquartered in NIAR’s Advanced Joining & Processing Lab. In order to be a CFSP research site, Wichita State must maintain five industry and/or government sponsors that contribute at least $150,000 in yearly membership fees.

**FY2010 PROJECTS**
- Performance Evaluation of Discontinuous Friction Stir Welding
- Effect of Surface Treatment and Sealant on the Faying Surface of Swept Friction Stir Spot Welds
- “Low” Z force FSSW – Conventional Tool & Process Development Approach (Year 2)
- Analysis of FSW Utilizing FSW Analysis Tool Software 2.0
- Formability and structural integrity characteristics of FSW lightweight alloys at elevated temperatures

**CFSP RESEARCH SITES**
- South Dakota School of Mines & Technology (headquarters)
- University of South Carolina
- Brigham Young University
- Missouri University of Science and Technology
- Wichita State University/National Institute for Aviation Research

**WSU SPONSORS**
- Bombardier Learjet
- Cessna Aircraft Company
- Embraer
- Federal Aviation Administration
- General Motors
- Hawker Beechcraft
- Spirit AeroSystems

**CONTACT**
Dwight Burford, Ph.D.
dwight.burford@wichita.edu
(316) 978-3204

www.niar.wichita.edu/advancedjoining
The Center of Excellence for Composites and Advanced Materials (CECAM) provides the nation with a center for the validation and quality assurance of composites and advanced materials to be applied in the construction of large commercial transport aircraft through:

- Research, testing, certification and technology transfer
- Coordination and cooperation with the FAA, large commercial transport aircraft manufacturers, materials suppliers and airline companies
- Education of the aircraft manufacturing and maintenance work forces

CECAM is part of the FAA’s Joint Advanced Materials and Structures Center of Excellence (JAMS) and focuses primarily on the safety and certification of emerging applications of composites and advanced materials in commercial transport aircraft.

CECAM is led by Wichita State University with core members from Northwestern University, Purdue University, Tuskegee University, the University of Delaware and the University of California at Los Angeles.

**2011 CECAM PROJECTS**

- Impact Damage Formation on Composite Aircraft Structures - Hyonny Kim, University of California - Los Angeles
- Statistical Analysis Program For Generating Material Allowables - Suresh Keshavanarayana, Ph.D, Wichita State University

**CONTACT**

Tracee Friess
tracee.friess@wichita.edu
(316) 978-5597

www.niar.wichita.edu/cecam
The mission of the FAA’s **Center of Excellence for General Aviation Research** (CGAR) is to utilize the world-class talents of general aviation consortium members to make significant contributions toward improvements in safety and efficiency for General Aviation air transportation.

Member universities include Wichita State University, Embry-Riddle Aeronautical University (lead university), the University of North Dakota, the University of Alaska, Florida A&M University (affiliate member) and Middle Tennessee State University (affiliate member).

### 2010 RESEARCH PROJECTS

**Wichita State University:**
- Information Dissemination – COE Materials and Meeting Support for COE Public Meeting

**Embry-Riddle Aeronautical University:**
- GA-COE Management Project
- Training Standards Development for General Aviation Aircraft
- Pilot Study of the FAA’s OSE of the GTG and NCV Products
- Pilot Study of the OSE of the GTG and NCV Products
- Remote Airfield Lighting Systems
- Independent operational T&E on NAS-ADS-B
- Program Management support for the US Airways And Aviation Communication & Surveillance Systems Project
- GA Systems Safety Management Research
- Flight Data Monitoring: General Aviation Safety Information Analysis & Sharing
- Weather Technology in the Cockpit – Pilot Training Requirements

**University of North Dakota:**
- Business Jet Loads Data Acquisition
- Octane Enhancers from Crop Oils
- Development of UAS Operational Data Collection Concept
- Friction Study
- GA Systems Safety Research
- Weather Technology in the Cockpit – User Needs Segment
- Subject Matter Expert Support for FAA UAS Simulator Workstation
- Helicopter lighting system
- FDM -GASIA & sharing phase II

**University of Alaska – Anchorage:**
- ADS-B Aviation-Related Research, Consulting, and Training Services as Part of the FAA’s ADS-B Program.
- Remote Airport Lighting Systems III
- GA Systems Safety Management research
- Weather in the Cockpit (WITC) - Concept of Operations

**University of Alaska – Fairbanks:**
- Development of a 3-Dimensional Radar Based Airspace Monitoring and Surveillance Instrument

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**University of Alaska – Fairbanks:**
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The National Center of Innovation for Biomaterials in Orthopaedic Research (CiBOR) is an independent not-for-profit organization dedicated to researching and developing the potential of composite materials for use in a wide variety of bioscience and medical applications, including the manufacture of orthopaedic implants.

Wichita State University and Via-Christi Health are co-sponsors of CiBOR. In addition to sharing resources and personnel, in 2011 NIAR and CiBOR will work together on the execution of a $1.6 million study for the research and development of battlefield stabilization and extraction devices for the United States Department of Defense.

**2010 ACCOMPLISHMENTS**
- Created CiBOR’s business management and operating structure
- Incorporated in the state of Kansas
- Named a Board of Directors, held three board meetings and established four committees
- Received 501(c)(3) status
- Received a Knight Foundation grant of $2.1 million over five years
- CiBOR board-approved FY2010 business plan established
- Developed dedicated financial, information technology and other business systems
- Developed key policies and procedures
- Developed an industry assessment tool (Product Analysis Matrix)
- Established disciplined processes for pursuing customer revenues
- Created a state-wide database of biomaterial manufacturers’ capabilities
- Created and staffed critical management and scientific positions
- Established CiBOR’s headquarters at 9229 E. 37th St. North in Wichita, Kansas
- Renovated space to house three laboratories: Composites, Bioengineering and Imaging
- Secured additional space for future laboratories
- Acquired $1.012M in scientific equipment including:
  - Axio Imager
  - Sputter SEM
  - CNC 5-Axis Machine
  - Portable Digital X-ray System
  - 3D Production System
  - Retiga Digital Camera
  - Bose Material Testing System
  - Micro CT Scanner
  - Zeiss Optical Microscope
- Working with four device companies and the Department of Defense, identified seven initial projects and signed two research contracts

**CONTACT**
Rich Sullivan, President & CEO
richard.sullivan@ncibor.org
(316) 247-7900

www.ncibor.org
Established in 1983, the WSU Regional Kansas Small Business Development Center (KSBDC) provides free consultation services and affordable training in a 23-county region of north and south central Kansas. The center serves both entrepreneurs ready to start new businesses and owners of established businesses ready to grow.


WSU KSBDC consultants increase economic prosperity in the region by providing expert assistance with all aspects of business management, marketing, and finances. They work individually with clients in areas that include business planning, access to capital, cash flow development, marketing research, and human resource issues.

The center offers over 175 workshops every year on topics that include starting a business, writing a business plan, state and federal taxes, winning government contracts, QuickBooks, low and no cost marketing, business contract basics, succession planning, customer service and strategic planning.

In 2009, the WSU KSBDC initiated two Business Resource Expos as a response to massive lay offs and economic downturn in the area. Over 300 participants connected with 22 area resource providers in the Expo Hall. The Expos also included keynotes presented by WSU KSBDC staff and 12 “Half Hour How To” workshops on varied business topics.

The WSU KSBDC partnered on a successful Workforce Innovation in Regional Economic Development (WIRED) grant from the U.S. Department of Labor. With grant support, staff members provided strategic planning assistance to 19 composite technology companies.

Since starting as regional director in 1999, Dr. Marcia Stevens has significantly increased the service area and output of the Center. She provides oversight for a budget that is funded by grants from the U.S. Small Business Administration and the Kansas Department of Commerce and by match and in-kind funds from WSU, CloudCorp, Cowley College, Cowley County Economic Development, Harvey County Economic Development Council, Kingman County Economic Development Council, and Sumner County Economic Development.

**CONTACT**
Marcia Stevens, Ph.D.
martia.stevens@wichita.edu
(316) 978-3193

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**Economic Impact of Wichita State Regional KSBDC CY 2009**

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clients served</td>
<td>669</td>
</tr>
<tr>
<td>Workshops Offered</td>
<td>193</td>
</tr>
<tr>
<td>Workshop Attendees</td>
<td>1,853</td>
</tr>
<tr>
<td>New businesses started</td>
<td>67</td>
</tr>
<tr>
<td>Full-time jobs created</td>
<td>195</td>
</tr>
<tr>
<td>Part-time jobs created</td>
<td>249</td>
</tr>
<tr>
<td>Full-time jobs retained</td>
<td>425</td>
</tr>
<tr>
<td>Part-time jobs retained</td>
<td>335</td>
</tr>
<tr>
<td>New sales generated</td>
<td>$17,976,317</td>
</tr>
<tr>
<td>Economy investments</td>
<td>$2,639,984</td>
</tr>
<tr>
<td>Secured 94 loans</td>
<td>$10,249,389</td>
</tr>
</tbody>
</table>

**WSU KSBDC Clients Experienced:**

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales growth</td>
<td>19.93%</td>
</tr>
<tr>
<td>compared to Kansas Business</td>
<td>-2.00%</td>
</tr>
<tr>
<td>Job growth</td>
<td>46.69%</td>
</tr>
<tr>
<td>compared to Kansas Business</td>
<td>-1.02%</td>
</tr>
</tbody>
</table>

www.ksbdc.biz
The National Center for Aviation Training (NCAT) was primarily funded and built by Sedgwick County in 2010 to meet aviation manufacturing workforce demand. Wichita Area Technical College manages the center and partners with Wichita State University’s National Institute for Aviation Research (NIAR) to provide industry-driven training courses.

This world-class training facility provides the opportunity to receive hands-on, real-world training in the areas of general aviation manufacturing and airframe and power plant mechanics. NCAT consists of three buildings: Advanced Manufacturing Technology Center (80,948 sq. ft.), the Aviation Service Center (96,243 sq. ft.) and an Assessment and Administration Center (30,435 sq. ft.) for admissions, student services and employment placement. To meet the critical shortage of skilled aviation workers, program development includes:

- Aerostructures
- Aerospace Coatings and Paint Technology
- Robotics
- Aerospace Quality Control
- Applied Science of Aviation Interiors
- Applied Science of Aviation Manufacturing
- Aviation Maintenance Technology
- Avionics Technology
- CAD/CAM: CATIA/ENOVIA
- Composites Technology
- Welding
- Machining Technology
- Nondestructive Testing

Through Wichita Area Technical College, the National Center for Aviation Training offers 22 aviation degree and certificate programs. The following degree types are available:

- Associate of Applied Science (AAS)
- Technical Certificate (TC)
- Certificate of Completion (COC)

Individual courses can also be taken as needed for those that are already in the aviation field that want to advance their career or update technical knowledge. Many of the courses can be taken as non-credit or credit courses through Wichita Area Technical College or Wichita State University.

CONTACT
National Center for Aviation Training
4004 N. Webb Road
Wichita, KS 67226
(316) 677-9400
It has been five years since NASA established the National Center for Advanced Materials Performance (NCAMP). With older programs such as ACG MTM45-1 and Hexcel 8552 coming to an end, NCAMP is ushering in new material systems for testing and taking on increased responsibilities in 2011.

In 2010, testing for the Cytec 5250-5 program was completed as well as a significant portion of Cytec 5215. In 2011, the priority is to release material property data reports and statistical analysis reports for both Cytec programs and finalize material and process specifications for ACG MTM45-1 and Hexcel 8552. In addition, 2011 will bring the completion of the Renegade Materials MVK-14 Freeform Polyimide T650 3K 8HS program and testing will commence on the latest programs funded by the Air Force Research Laboratory, Cytec 5320-1 T650 uniax and 3K plain weave fabric.

The most significant milestone in 2010 was the release of FAA Memo AIR100-2010-120-003 (available at www.niar.wichita.edu/media/AIR100-2010-120-003.pdf), which describes the FAA’s acceptance of NCAMP-generated composite specifications and material allowables. The memo also explains the FAA’s acceptance of the NCAMP equivalency process; a process that allows aircraft companies to utilize the material property data of a previously qualified material. In other words, aircraft companies that wish to use composite materials no longer need to perform expensive and time-consuming qualifications on their own. For the composites materials that have been previously qualified by NCAMP, they only need to show equivalency to the existing shared material property database, potentially realizing significant time and cost savings. The process that is recognized by the FAA is outlined in NCAMP’s Standard Operating Procedure, NSP 100 (available at www.niar.wichita.edu/media/NCAMP_SOP.pdf). In essence, the composites industry has reached the maturity and efficiency levels similar to that of metals industry.

NCAMP will work with CMH-17 to include the NCAMP-generated data and material allowables into CMH-17 Vol. II. NCAMP will also work with the Society for Automotive Engineers (SAE) to create SAE Aerospace Material Specifications.

To keep up with NCAMP, subscribe to the e-bulletin by contacting Yeow Ng.

CONTACT
Yeow Ng, Assistant Director
yeow.ng@wichita.edu
(316) 978-5212

www.niar.wichita.edu/ncamp
The NIAR/Industry/State (NIS) research program was created by the Kansas State Legislature in 2004 to support the efforts of the Kansas aviation manufacturing industry to compete in the global environment.

While this research program is operated through NIAR, all research projects are identified and selected by an executive committee composed of representatives from The Boeing Company, Bombardier Learjet, Cessna Aircraft Company, Hawker Beechcraft Corporation and Spirit AeroSystems. WSU’s associate provost for research, the executive director of NIAR and the dean of the College of Engineering serve in a project management capacity.

NIS received $5 million for the 2011 fiscal year to support 22 research projects.

**FY2011 PROJECTS**
- Repair of Composite Structures (including sandwich)
- Blind or One-Sided Fastener Usage in Composite Structures (Product and Repair Applications)
- Quiet Interiors Development
- Characterization and Testing
- Composite Bearing Allowables Base
- Electromagnetic Characterization of Composite Fuselages
- Effects of Manufacturing Defects on Composites Materials (NDI Development)
- Engine Inlet Ice Protection System
- Influence of Environmental Knockdown Factors in Composite Design Structural Margins
- Acoustical impact to composite sandwich structures (dampening, core, shear and thermal)
- Simulation and modeling of bird strike testing
- Large Scale Tooling Prediction for Composite Structures
- Thermal Effects of Paint on Composite Structures
- Virtual Environment Study (including ECS systems - CATIA to VR)
- Legacy Domain and Data Knowledge Preservation
- Ground Deice Fluid Equivalency
- Fastended Joint B-Basis Allowables
- Stacked Drilling of Composites and Titanium
- Mechanical and Microstructural Property Evaluation of Joined and Deposited Titanium Structures
- Damage Growth of Fluid Ingression in Sandwich Panels
- Laminate Level testing 5330
- Modeling Direct Effects of Lightning

**CONTACT**
Gabrielle Dodosh, NIS Liaison
gabrielle.dodosh@wichita.edu
(316) 978-5218

www.niar.wichita.edu/nis
The National Institute for Aviation Research is an unincorporated division of Wichita State University, a state-owned entity.

Wichita State University does not discriminate in its programs and activities on the basis of race, religion, color, national origin, gender, age, sexual orientation, marital status, political affiliation, status as a veteran or disability. The following person has been designated to handle inquiries regarding nondiscrimination policies: Director, Office of Equal Employment Opportunity, Wichita State University, 1845 Fairmount, Wichita KS 67260-0205; telephone (316) 978-6791
The National Institute for Aviation Research is located on the beautiful, 330-acre campus of Wichita State University in Wichita, Kansas. The university’s status as Kansas’ only urban serving research institution allows it to combine a traditional college atmosphere with the endless opportunities of the state’s largest city to form an educational experience without limits.

At Wichita State, students have it all: first-class academic programs; the state’s largest annual scholarships; some of the country’s best research facilities; access to more jobs, more internships and more industry experts than all the other state schools in Kansas plus a vast network of worldwide connections.

Beyond the classroom, Wichita State is a haven for research. From improving aviation safety through its connection with NIAR to analyzing the city’s housing market, the university has a wide range of research partnerships focused on creating a better tomorrow for the city of Wichita, the state of Kansas and the world.

To learn more visit www.wichita.edu.