Located on the Wichita State University campus, in a city recognized as the Air Capital of the World, NIAR integrates university, government and industry in cooperative efforts to advance technologies for aviation safety and manufacturing. Our 120,000 square-foot facility is recognized internationally as a high-tech research and development, testing, certification and learning center.

Aviation has been a part of the Wichita community for many years, and since 1984, NIAR has been an integral partner. Since that time, we have made a name for ourselves as one of the few state-of-the-art aviation research centers in the United States recognized for our contributions to aviation safety and performance.

As you explore our annual report, you will see our role in supporting the revamping of aircraft design and manufacturing.

MISSION
To conduct research, transfer technology and enhance education for the purpose of advancing the nation’s aviation industries that may benefit from aviation related technologies.
Dear Colleagues:

The past year has been an exciting one for NIAR. The Institute's research and development budget increased by 24 percent and staff by 29 percent. The growth and the Institute's ability to support industry continues to depend on the support of the Kansas State Legislature, the Kansas Congressional Delegation and the Kansas Technology Enterprise Corporation (KTEC). The Institute's ability to support industry continues to depend on faculty interests and capabilities from WSU's Colleges of Engineering, Business and Liberal Arts and Sciences. The ability to support industry continues to depend on the support of the Kansas State Legislature, the Kansas Congressional Delegation and the Kansas Technology Enterprise Corporation (KTEC). The Institute's ability to support industry continues to depend on faculty interests and capabilities from WSU's Colleges of Engineering, Business and Liberal Arts and Sciences.

The Institute has expanded the reach of our aerospace R&D efforts. In FY 2005, federal agencies funded more than 60 percent of the budget, providing more than $15 million to support research and development efforts. NIAR integrates university, government and industry in cooperative efforts to advance research, design, testing and certification by providing reliable test equipment. This laboratory strengthens NIAR's capabilities to perform research, testing and certification on aircra...
The Advanced Joining Technology Laboratory was established in January 2005 with the installation of an MTS® ISTIR PDS Friction Stir Welding (FSW) machine. With the addition of this new 5-axis, purpose-built FSW machine, NIAR has the capability to perform advanced FSW research and prototyping including developing structures with complex contour joints in an array of materials. FSW is emerging as a viable manufacturing process with many applications for joining metals and plastics, and is supported by the interest of local aviation industry.

FSW is a solid-state joining process developed and patented by The Welding Institute (TWI-UK) in 1991. It involves rotating a specially designed, non-consumable weld tool in a material to form a continuous joint by generating frictional heating and sufficient forging and extruding forces. No melting is involved.

Funding to conduct FSW research is provided by grants from NIAR/Industry/State (NIS) and the Federal Aviation Administration (FAA). Research programs are being carried out with the support of industrial participants. Collaboration with other universities and industrial partners through the Industry/University Cooperative Research Centers (I/UCRC) program, sponsored by the National Science Foundation (NSF), has been initiated.

2005 Highlights:

Research: FSW investigations into post weld heat treatments for 2000 and 7000 series aluminum-aluminum alloys.
Objective: Determine the extent to which thermal treatments can restore exfoliation and stress corrosion resistance of 7075-T73 and 2024-T3 aluminum alloys, for example, and their corresponding effect on mechanical properties.

Research: Structures testing and finite element modeling of flat 2-" x 2-" stiffened panels fabricated using FSW.
Objective: Evaluate the static strength performance of the FSW panels as they compare with conventional riveting technology tested in compression, tension and shear. Lay groundwork for fatigue testing of riveted and friction stir welded panels to generate S-N and dN/dN data.
The Walter H. Beech Memorial Wind Tunnel was rededicated during a ceremony in January 2005 after the completion of a $6 million upgrade. The improvements exceeded the requirements and expectations required by industry.

With the help of a new 2,500 HP variable-frequency electric fan, the upgraded and modernized wind tunnel can now reach and maintain test section dynamic pressures of greater than 100 psf and a Reynolds number per foot of greater than 1.6M with 10% blockage.

A new active heat exchanger removes heat that builds during high-speed wind tunnel tests. The heat removal system allows these high dynamic pressures and Reynolds numbers to be maintained throughout the entire test.

The Walter H. Beech Memorial Wind Tunnel is the only tunnel of its kind on a university campus that has an active heat exchanger. This feature allows researchers to utilize the tunnel 24 hours a day, 7 days a week, without sacrificing test section performance.

The tunnel’s new external balance provides 0.002% full-scale measurement resolution on wind tunnel models. This precision allows tunnel clients to measure the smallest changes for significant gains in vehicle performance.

The lab also benefits from a new real-time data display software program developed in-house by the NIAR CAD/CAM Lab. This unique addition enhances customer experiences by providing instant data-reduction to provide a presentation package during the tests.

The combination of improved test conditions and data collection performance provides clients with reliable, high-quality data.

Since its relocation to NIAR’s Aircraft Structural Testing and Evaluation Center (ASTEC) on the campus of Raytheon Aircraft Company, the Aging Aircraft Laboratory has greatly expanded its capabilities and activities.

The lab is currently conducting research supported by the FAA Technical Center and supports the growing mission of the United States Air Force to maintain its fleet of aging military aircraft. It also supports the ongoing efforts involved with advanced health monitoring techniques to detect structural degradation.

In the past year, the lab has been engaged in several research projects including:

- FAA tear-down evaluation: Cessna 402A/C and Piper Navajo
- B-52 wing sections and fuselage bulkheads
- B-52 front spar terminal fitting
- B-52 forward gear assemblies
- C-5A major structural components
- C-130 outer wing sections

Highlights:

- Programs will continue for the FAA and B-52 with additional tear-down and inspections proposed on F-16 aircraft.

The aerodynamics lab has access to four wind tunnels and a water tunnel. These provide researchers, government agencies and industries the ability to test components in a wind tunnel with the conditions needed to make our lives safer and more efficient.

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Highlights:

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As one of the leading universities in aviation icing research, the lab has conducted an experiment to study LIC icing in relation to the world's most detrimental icing conditions.

Research: Experimental Investigation of the AIAA Ice Protection System
Objective: Develop a wind tunnel model and an experimental setup to investigate the performance of liquid-ice air protection systems. Conduct experiments at the NASA Glenn Icing Research Tunnel to develop a database for use in system design and for code development and validation.

Objective: Experimental Investigation of Puget Sound Impingement and Spreading
- Staff size increased by nearly 10 percent since FY 04. The lab employs 10 full-time managers, 15 full-time engineering support staff, and 67 undergraduate/graduate students.
- Supported development of material characterization effort of approximately 40 aerospace and non-aerospace related companies. These efforts involved non-metallic and metallic advanced materials. Coupon and element testing was performed for a wide range of research and material characterization efforts.
- Investigated the effects of different variables on the static and repeated load performance of scarf repairs applied to composite laminates and sandwich structures currently in service, to understand the aging mechanisms of these structures. The results of this program will be used by the FAA to assess the structural health of composite horizontal stabilizer and a Beechcraft Starship structures.
- Published several FAA technical reports related to adhesive bonding, composite repair, damage tolerance and material and process specifications guidelines for composites.
- Hosted the annual meeting for the FAA Joint Advanced Materials and Structures Center of Excellence (JAMS). Offered an introductory composite short course for the aviation industry. Twenty people from the local aerospace industry attended. Due to the success of this course, plans are set it already.

Aircraft Icing

Wichita State University is one of the nation's leading universities in aircraft icing research. The goal of the Aircraft Icing Laboratory is to conduct research that will contribute to the worldwide effort to reduce dangers to aircraft flying in icing conditions.

As part of this continued effort, the lab has established working relationships with U.S., Canadian and European governments, universities and agencies such as NASA and the FAA. It is through these relationships that NIAR can continue to make a contribution in icing research.

2005 Highlights:
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Composites and Advanced Materials

The Composites and Advanced Materials Laboratory continues to work with NASA’s two recently established centers in advanced materials – the FAA Joint Advanced Materials and Structures Center of Excellence (JAMS) and the NASA National Center for Advanced Materials Performance (NCAMP). The lab continues to work with the FAA on several programs continuing in the lab and provide support to the aircraft industry.

2005 Development:
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The mission of the Crash Dynamics Laboratory is to provide a state-of-the-art service center with technologically-advanced test equipment to aid in the research, design, testing and certification of occupant protection systems. Accomplishing this mission has become much easier with the completion of a $3 million upgrade in the past year. The new equipment improves the lab’s ability to conduct crash tests for the aviation industry and allows for expansion into the automotive industry. Testing on air bags, child seats and other various components is now possible.

With so many new testing possibilities, the lab has geared up for a busier test schedule by hiring Research Scientist Dr. Gerardo Olivares, Lab Manager Chad Gadberry and three new lab technicians. The lab is now capable of running 10-hour days when necessary.

2005 Highlights:

The lab currently houses 15 servo-hydraulic load frames for durability and residual fatigue life in older aircraft. Successful installation and operational checkout of the MTS Crash Simulator, Model 888.20.

Return to dynamic testing of aircraft seats and restraints.

Successful completion of the following automotive crash pulses:

- FMVSS 213
- Typical FMVSS 208 Crash Testing
- EuroNCAP
- UNNCAP
- IIHS

2005 Highlights:

Successful installation and operational checkout of the MTS Crash Simulator, Model 888.20. Installation of the new high-sensitivity (194 kW) photographic lighting system.

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Successful completion of the following automotive crash pulses:

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Research: Data and Methodologies for Structural Life Evaluation of Metallic Rotorcraft Components

Objective: Support the revision of the FAA advisory circular AC-23-13 by adding new fatigue data that will facilitate better structural health evaluation at high strain rates.

Objective: Research on high-strain-rate loading was achieved using a MTS servo-hydraulic high-stroke-rate machine capable of actuator speeds up to 500 in/sec.

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Research: Effect of Shot Peening for Metallic Rotorcraft Components

Objective: Determine the effects of shot peening on crack initiation and growth in aluminum alloys used in the rotorcraft industry.

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Since 2004, the Full-Scale Structural Testing Laboratory has conducted many research, testing and certification projects and increased its full-time staff from 13 to 19.

The facility is located at NIAR’s Aircraft Structural Testing and Evaluation Center (ASTEC) on the Raytheon Aircraft manufacturing campus in Wichita, Kan. It provides 46,000 sq. ft. of hangar space, access to an 8,000 ft. runway and nearly $10 million in test equipment.

Raytheon Aircraft was the lab’s launch customer providing structural testing for Raytheon’s entire aircraft product range.

In the past year the lab has initiated several test projects, including development, substantiation and certification of static and durability testing of aircraft.

Certification: Completed one lifetime of the Hawker Horizon wing DDT testing. Began the second lifetime of testing.

Objective: To perform certification full-scale durability and damage tolerance testing for a typical loading spectra and mode per FAR Part 23.

Validation: Completed static testing on two EPIC Aircraft LT composite wings.

Objective: To subject the wing assembly to critical design loads.


Objective: To perform certification, full-scale durability and damage tolerance testing for a typical loading spectra and mode per FAR Part 23.

Because people are the most complex component within any aviation system, government agencies and conscientious designers have employed the science of human factors engineering to improve the usability, safety and customer satisfaction of their products.

In the past year the research projects of the Human Factors Lab required the hiring of an additional research scientist, Dr. Chris Hamblin. The lab now provides applied research and engineering services that clients can use to make an immediate impact on their products.

Focus Areas:
- Aviation Maintenance
- Pilot Information Management
- Training
- Digital Human Modeling
- Decision-Making

SPECIALIZING IN UNDERSTANDING COGNITIVE AND PERCEPTUAL PROCESSES, THE HUMAN FACTORS LAB HELPS OPTIMIZE THE PERFORMANCE OF HUMANS IN OPERATING COMPLEX SYSTEMS.

2005 Highlights:
- Aging Pilot Study for the AOPA: Faculty and students are working on a study in cooperation with the AOPA to determine how age may affect the abilities of pilots.
- Sandia National Laboratories: The Human Factors Lab, in cooperation with WSU’s Software Usability Research Lab (SURL) has partnered with Sandia National Laboratories to test and evaluate new software applications that use cognitive models of the user to improve human-computer interaction.
- Technical Writing Workshop: Faculty and students organized the first Aviation Technical Writers Workshop. The event was organized as part of ongoing research funded by the Federal Aviation Administration in an effort to improve maintenance documentation.
- Maintenance Training in Virtual Reality: The Human Factors Lab completed a study that evaluated the use of different VR technologies for training complex assembly procedures. The results of the study are being applied to enhance the training of aviation maintenance personnel.
The Structures Laboratory supports numerous research projects funded by the FAA, and NASA/Industry/State (NIAR). It also generates FAA-approved advanced composite assembly design allowables for a broad range of aircraft operations. Numerous publications resulting from these projects have attracted much attention from industry, commercial and military aviation partners. To conduct detailed research related to damaged tolerance, effects of defects and element testing for design and certification of aircraft and interior systems, the Structures Laboratory is equipped with presses, autoclaves, and autoclave composite processing systems, the Center for Excellence in Composites and Advanced Materials (CECAM) and the National Center for Advanced Materials Performance (NCAMP).

The lab also supports the testing needs of the FAA Center for Excellence in Composites and Advanced Materials (CECAM) and the National Center for Advanced Materials Performance (NCAMP). The Structures Laboratory provides research capabilities for test articles ranging from material coupons to large scale structures. The lab is designed to characterize the load carrying capability of materials.

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The CAD/CAM Laboratory offers courses for industry employees and WSU students. Some of the classes offered include CATIA V5 Part Design & Sketcher, Assembly Design, Draughting, Wireframe & Surfaces, Fitting Simulation & Kinematics, Prismatic Machining, Surface Machining, Functional Tolerancing & Annotation and Stress Analysis. In 2005, the CAD/CAM Lab provided 44 classes to nearly 500 students. The lab provides on-site training to aviation companies and provides curriculum to a number of schools and companies. The lab continues to expand its curriculum by working on new courses.

Courses in development:
- ENOVIA assembly
- CATIA V5 Sheet Metal for Aerospace

One of the largest university-based teaching facilities in the U.S., the CAD/CAM Lab provides current CATIA® education and technical support for a variety of mechanical and electrical CAD/CAM and other computer graphics applications.

On-site training provided to:
- Rocketplane Limited Inc.
- GKN Aerospace
- Cessna
- Boeing Wichita

Partnerships:
- Dassault Systemes
- Tridaq
- MSC Software
- CGTech Vericut
- ICAM

Curriculum acquired by:
- Airbus North America
- Aviation Technology Group
- Boeing Wichita
- Cessna Aircraft Company
- Raytheon Aircraft Company
- U S Engineering
- Schoolcraft College
- Spirit Aeronautics

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The Research Machine Shop provides quality machining support for research activity at NIAR and WSU. This past year the shop has supported several labs including Aerodynamics, Composites, Metrology, Advanced Joining Technology, Fatigue and Fracture and Crash Dynamics. Among the projects completed were the fabrication of a water tunnel model for Rocketplane Ltd., Inc. and the upgrade of model-machining hardware inside the tunnel. Shop staff have also worked on wind tunnel projects for NASA.

2005 Highlights:
- Designed and fabricated a NASA wind tunnel test section and models for droplet trajectory and impact research.
- Provided support to Composite and Structures Labs through machining, tooling and specimens.
- Provided support to WSU Chemistry Department by providing specimens, fixtures and several other small projects.
- Provided support to Advanced Joining Technology Laboratory in machining panel fixtures and new configurations of pin tests.
- Assisted in upgrades of Walter H. Beech Memorial Wind tunnel and many projects in support of daily wind tunnel operations.
- Fabricated a water tunnel model for Rocketplane Ltd., Inc.
- Updated a sensor tunnel model for Rocketplane Ltd., Inc.
- Provided support to Research Machine Shop by providing specimens, fixtures and several other small projects.

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The Research Machine Shop has had a history of success, from the construction of the Walter H. Beech Wind Tunnel in 1946, to the building of composite tools and advanced fixtures. The shop continues to be a state-of-the-art facility capable of meeting industry needs.
The Visual Technology Laboratory (VTL) is the creative department of the Institute. Using the latest MAYA 3D modeling, animation and rendering package, the VTL creates elements for various companies, WSU and NIAR. In the past year, the VTL continued providing graphic elements for Koch Arena programs and WSU basketball. The lab has worked with marketing and media companies including Get Reel, CG Productions, Intake and BG Products.

Enrollment in the lab’s 3D Camp also continues to grow.

In the coming year, the VTL plans to more closely coordinate its classes with WSU’s art department to create a program with a solid foundation. It will also start to develop classes to coordinate MAYA classes with Computer Aided Three-Dimensional Interactive Applications (CATIA) classes, the primary CAD/CAM program used in the aircraft industry.

**2005 Highlights:**
- Co-produced (with Impact Studios) a new opening animation displayed on the scoreboard at Koch Arena for the 2005-2006 WSU basketball season and created additional scoreboard animations, including a 10th-year logo.
- Created an animated character, "Thumby," for a Public Service Announcement discouraging smoking for Get Reel Productions.
- Created an animated character, “Squeeky” for Kansas’ Best and composited character into video shots provided by the WSU Media Resources Center.
- Produced animated elements for the “Bobby Likis 10 Most Wanted Car Killers” campaign for BG Products.

**2006 Highlights:**
- In partnership with academia, industry and government to provide timely, cost-effective, validated, advanced technologies and a skilled work force to improve airworthiness assurance over the short, mid and long-term. It will maintain a repository of knowledge and build a talent pool which will improve aviation safety and strengthen the competitive position of the U.S. aviation industry.

**FAA Airworthiness Assurance Center of Excellence (AACE) is a core member of AACE, along with 29 other universities.**

**2005 Highlights:**
- Testing Full-Scale Composite Sandwich Fuselage Panels
- Adhesive Characterization and Element Testing of Fatigued and Damaged Bonded Joints
- Laminate Sizeable Adhesive Generators for Fiber Reinforced Composite Materials
- Dynamic Seat Cushion Replacement for Aircraft
- Implementing Usability Techniques in the Development of Aviation Maintenance Manuals
- Development of a De Facto Standard for Test Calibration Program
- Evaluation of Atmospheric Conditions for Aging Small Airplanes
- Data and Methodologies for Structural Life Evaluation of Small Airplanes
- Fatigue Crack Growth Testing to Quantify the Effects of Shot Peening for Metallic Aircraft Components
- Statistical Loads Database Development
- Aging of Composite Aircraft Structure: Decommissioned Boeing 737 T2T
- Continued Electromagnetic Protection Industry for Aircraft and Systems - Phase IV
- Identifying Techniques for Improving the Reliability of Aviation Maintenance Manuals

**NATIONAL INSTITUTE FOR AVIATION RESEARCH**
CDCAM mission is to provide the nation with a center for the validation and quality assurance of composites and advanced materials to be applied to the construction of large commercial transport aircraft through (1) research, testing, certification and technology transfer; (2) coordination and cooperation with the FAA, large commercial transport aircraft manufacturers, materials suppliers and airline companies; and (3) education of the aircraft manufacturing and maintenance work force.

NIAR was designated as a Center of Excellence for Composites and Advanced Materials (CECAM) in December 2003. NIAR focuses primarily on the safety and certification of emerging applications of composites and advanced materials in commercial transport aircraft.

CECAM is composed of an academic team of universities that complement each other's interests and expertise in research areas associated with advanced materials. The center 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.

Objective: Perform basic and applied research within specific technology areas and facilitate growth and education of the use of advanced materials with emphasis on the needs of the large transport aircraft industry while supporting the safety and certification issues involved with airworthiness assurance.

2005 Highlights:
- Aging of Composite Aircraft Structures: Beechcraft Starship Teardown
- Production Control Effect on Composite Material Quality and Stability
- Crackworthiness of Composites - Material Dynamic Properties
- Effect of Impact Procedure Applied to Composite Airframe Structures
- Surfaces for Subsequent Adhesive Bonding
- Quality Assurance Methods for Fiber Reinforced Composites
- Tuning of Failure in Holiday Detection and Repair Processes in Aircraft Application
- Production Control Effect on Composite Material Quality and Stability
- Methods for the Evaluation of the Fitness of Fiber Reinforced Composites
- Structure Health Monitoring for Life Management of Aircraft
- Damage Tolerance and Durability of Fiber Metal Laminates for Aircraft Structures
- Damage Science and Durability of Fiber-Metal-Laminates for Aircraft Structures
- Nanophased Skin-Stringer Assembly for Aircraft Structures
- NASA/MSFC Collaboration for Aircraft Structures
- University of Delaware: NASA/MSFC Collaboration for Aircraft Structures
- University of California at Los Angeles: Damage Science and Durability of Fiber-Metal-Laminates for Aircraft Structures
- Purdue University: Damage Science and Durability of Fiber-Metal-Laminates for Aircraft Structures
- Tuskegee University: Nanophased Skin-Stringer Assembly for Aircraft Structures

FAA Center of Excellence for General Aviation Research

CGAR mission is to further aviation-related research, education, technology transfer and utilization in mission critical areas; to respond to the research interest and needs of the aviation industry through synergistic relationships developed between academia, industry and government.

In April 2001 NIAR became a core member of the FAA Center of Excellence for General Aviation Research (CGAR). The three major criteria of success are:

1. The ability of the Center to provide national leadership in resolving air transportation problems.
2. The ability to disseminate results through a continuing education program.
3. The ability to create self-sufficiency so the Center is not reliant upon funding support from the FAA.

Participating universities include Wichita State University, Embry-Riddle Aeronautical University, the University of North Dakota, Florida A & M University and the University of Alaska. Embry-Riddle is the lead university and handles the management of the organization. NIAR has a leadership role in composite materials and crashworthiness in this center. However, all universities are viewed as equal contributors to research activities.

2005 Highlights:
- Final report of the FAA/Industry Training Standards (HTS) program accepted and published by the Federal Aviation Administration
- University of California at Los Angeles: Damage Science and Durability of Fiber-Metal-Laminates for Aircraft Structures
- Purdue University: Damage Science and Durability of Fiber-Metal-Laminates for Aircraft Structures
- Tuskegee University: Nanophased Skin-Stringer Assembly for Aircraft Structures
- University of Delaware: NASA/MSFC Collaboration for Aircraft Structures
- University of North Dakota: NASA/MSFC Collaboration for Aircraft Structures
- Florida A & M University: NASA/MSFC Collaboration for Aircraft Structures
- Wichita State University: Aging of Composite Aircraft Structures: Beechcraft Starship Teardown
- Northwestern University: Effects of Impact Procedure Applied to Composite Airframe Structures
- University of California at Los Angeles: Structure Health Monitoring for Life Management of Aircraft
- Purdue University: Production Control Effect on Composite Material Quality and Stability
- University of Alaska: Production Control Effect on Composite Material Quality and Stability
- Tuskegee University: Methods for the Evaluation of the Fitness of Fiber Reinforced Composites
- Northwestern University: Surface for Subsequent Adhesive Bonding
- University of California at Los Angeles: Quality Assurance Methods for Fiber Reinforced Composites
- University of North Dakota: Production Control Effect on Composite Material Quality and Stability
- Florida A & M University: Production Control Effect on Composite Material Quality and Stability
NCAMP mission...As needed to provide the nation with a center for the validation and quality assurance of composites and advanced materials to be applied in the commercial and military aviation industry. Through its advisory council and executive committee, the center will continue to be a leader in composite technology development and bring together and to reduce testing via increased capability and use of numerical/analytical simulation tools.

Over the next decade, composites and advanced materials will be rapidly emerging, finding applications in design and finding their way into production lines throughout the aircraft industry. It is their superior strength and stiffness properties that have made them the structural material of choice for many aerospace applications.

In recent years, NASA, industry and the FAA have worked together to develop cost-effective methods of qualifying materials by sharing a central material qualification database, such as Military Handbook 17 and the database formed in the NASA Advanced General Aviation Transport Experiments (AGATE) program.

It is for this purpose that the National Center for Advanced Materials Performance (NCAMP) was developed. The concept behind this center of excellence was developed by NIAR in August 2004. The establishment of NCAMP provides the nation with a localized center for composite and advanced material validation and quality assurance.

The goal of NCAMP research is to integrate the technology into actual aircraft models and at the same time decrease the cost of these materials.

NCAMP’s technical approach consists of four tasks that are coordinated to provide the aviation industry with the most up-to-date solutions for the application of advanced materials into product integration and to eliminate redundancies in the current process. This will make composite materials as attractive to industry as metallic materials.

**Technical Tasks:**

- Providing Statistical Materials Management and Control
- Accelerating Advanced Materials Usage Program
- Using a Materials Scaling and Building Block Approach
- Applying Advanced Materials Processing Technology

NASA National Center for Advanced Materials Performance

**Objectives:**

- Increase the efficiency of advanced material implementation into new aircraft models and at the same time decrease the cost of these materials.
- Facilitate growth of the use of advanced materials in aircraft application while addressing safety and certification issues to ensure airworthiness assurance and safety.
- Examine old guidance materials related to advanced materials and determine their relevance with respect to new advances in technology.
- Promote the cost-effective use of composites and advanced materials to reduce the aircraft Direct Operating Costs (DOC).
- Integrate the results of research performed within NCAMP to form a basis for standard engineering practice and training within the advanced materials aircraft community and assist in creating relevant policy and guidance materials.

**NCAMP’s technical approach consists of four tasks that are coordinated to provide the aviation industry with the most up-to-date solutions for the application of advanced materials into product integration and to eliminate redundancies in the current process. This will make composite materials as attractive to industry as metallic materials.**

**Technical Tasks:**

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ADMRC mission...to address the practical problems associated with aircraft manufacturing.

**ADMRC mission...to address the practical problems associated with aircraft manufacturing.**

**MISSION...TO ADDRESS THE PRACTICAL PROBLEMS ASSOCIATED WITH AIRCRAFT MANUFACTURING.**

**Ice Particle Trajectory Program**

**Rapid Fabrication of Modular Composite Lay-up Tools**

**Virtual Reality System with Haptic / Auditory Devices for Assembly and Maintenance Training and Certification**

**Thermal Spray Coatings for Composite Structures in Aviation**

**Drilling of Composite Materials**

**Aircraft Interior Noise Reduction Studies for Composite Sandwich Panels**

**Effects of Cladding and Anodizing on the Fatigue Behavior of Varying Gage Aluminum Sheet**

**Aircraft Interior Noise Reduction Studies for Composite Sandwich Panels**

**Drilling of Composite Materials**

**Virtual Reality System with Haptic / Auditory Devices for Assembly and Maintenance Training and Certification**

**Thermal Spray Coatings for Composite Structures in Aviation**

**University of Kansas**

**University of Kansas**

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**NASA National Center for Advanced Materials Performance**

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**Aircraft Design & Manufacturing Research Center**

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The NIAR/Industry/State (NIS) research program was created by the State Legislature in FY 2004 to support the Kansas aviation manufacturing industry’s efforts to compete in the global technological environment.

While this research program is operated through NIAR, all research projects are identified and selected by an executive committee composed of representatives from Boeing, Bombardier Learjet, Cessna and Raytheon. WSU’s associate vice president for research, the executive director of NIAR and the dean of the College of Engineering serve in a project management capacity.

The first year of the program was funded in the amount of $1 million, which supported 10 research programs for 12 months. The second (FY2004) and third (FY2005) years of funding were approved by the State Legislature in the amount of $2 million.

2005 Highlights:
- Icing Tanker Spray Nozzle Characteristics and Performance Evaluation
- Design Philosophies for Structures Using Metal and Composites with Large CTE Differences
- Aviation Network Security
- Repair of Composite Structures
- Bluff or One-Sided Fastener Usage in Composite Structures (Production and Repair Applications)
- Cross-Test Review of Composite Fastening Structures
- Binary Code Investigation
- Acoustic Material Database
- Track-In-The-Field and Related Topics
- Tongue Overlap of Application to Support Aircraft Final Assembly
- Advanced Broached Composite Structures
- CATIA V5 Beta Model Generation – Automated Crack Analysis Tool
- Characterization of Fatigue Crack Development and Growth
- Review of the Capabilities of the Photogrammetry Technology as a Non-Destructive Testing Methodology
- Adhesive Joint Characterization and Testing
- Analysis of Braided Composite Structures
- CATIA V5 Beta Model Generation – Automated Crack Analysis Tool
- Characterization of Fatigue Crack Development and Growth
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- Adhesive Joint Characterization and Testing
**Established in 1983, the WSU Regional Kansas Small Business Development Center (KSBDC) provides no-cost consultation services and affordable training to more than 2,400 businesses per year in north and south-central Kansas. The center serves both entrepreneurial startups and established businesses in this region. Three full-time and two part-time professional consultants provide expertise and assistance for a wide range of business needs, including marketing, management, and technology. They work individually with clients in areas that include business planning, accessing capital, writing a business plan, state and federal taxes, choosing a business legal form, access to capital, cash flow development, marketing, and human resource management. The Center offers workshops on topics that include starting a business, marketing, management, and money. They help businesses ready to grow.

Dr. Marcia Stevens provides oversight for a budget that is funded by a variety of sources, including grants from the U.S. Department of Commerce, the Kansas Department of Commerce, and by grants from the U.S. Small Business Administration.

The KSBDC provides free consultation services and affordable training to more than 2,400 businesses per year in north and south-central Kansas. The center serves both entrepreneurial startups and established businesses in this region. Three full-time and two part-time professional consultants provide expertise and assistance for a wide range of business needs, including marketing, management, and technology. They work individually with clients in areas that include business planning, accessing capital, writing a business plan, state and federal taxes, choosing a business legal form, access to capital, cash flow development, marketing, and human resource management. The Center offers workshops on topics that include starting a business, marketing, management, and money. They help businesses ready to grow.

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As the official home of the National Institute for Aviation Research, the campus of Wichita State University is the perfect setting to foster top-notch education, cutting-edge research, and the people who make it happen.

WSU’s sprawling 330-acre campus is located within the city of Wichita, Kan., known as the “Air Capital of the World.” Each year almost 15,000 students from 48 states and more than 100 countries come to Wichita to study as Wichita State Shockers within the University’s six colleges.

In addition to its main campus, Wichita State features two full-service satellite facilities located throughout the city. And, as the state of Kansas’ only metropolitan university, WSU offers its students a virtually endless array of opportunities ranging from the availability of experts in practically every industry to one of the region’s largest cooperative education internship programs.

All of this, combined with the people and expertise of NIAR, makes the WSU community one of true Thinkers, Doers, Movers and Shockers.

WICHITA STATE UNIVERSITY
NATIONAL INSTITUTE FOR AVIATION RESEARCH
A Kansas Technology Enterprises Corporation
Center of Excelence

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The National Institute for Aviation Research is funded in part by the Kansas Technology Enterprises Corporation. NIAR is an intercorporated chapter of Wichita State University, which is a state-owned entity separately managed and distinct from Kansas Technology Enterprises Corporation.

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