

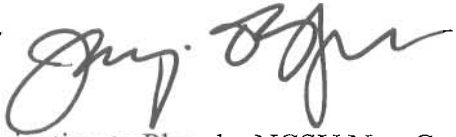
NC STATE UNIVERSITY

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July 14, 2008

MEMORANDUM

TO: Terri L. Lomax
Interim Vice Chancellor for Research and Graduate Studies

FROM: James L. Oblinger
Chancellor 

SUBJECT: Request for Authorization to Plan the NCSU NextGen Air Transportation Center (NGAT)

In response to your Memorandum dated July 10, 2008, authorization is hereby granted to plan the NCSU NextGen Air Transportation Center (NGAT) in accordance with NCSU Regulation 10.10.4 and Article II of the NCSU Centers and Institutes Management Guide. As the planning progresses, please keep me informed.

Best wishes for continuing progress with the development of this Center.

JLO/mh

cc: Mr. Robert S. Foyle, P.E., Interim Director of NextGen Air Transportation Center
Dr. Nagui Roupail, Director of ITRE
Mr. Matt Ronning, Associate Vice Chancellor, Director of SPARCS
✓ Ms. Larisa Oktyabrsky, Coordinator, Centers and Institutes, SPARCS



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July 10, 2008

MEMORANDUM

TO: Chancellor Dr. James L. Oblinger

FROM: Terri Lomax, Interim Vice Chancellor for Research and Graduate Studies *TLL*

SUBJECT: Request for Authorization to Plan the NCSU NextGen Air Transportation Center (NGAT)

On behalf of the Institute for Transportation Research and Education, I request authorization to plan the NCSU NextGen Air Transportation Center (NGAT) in accordance with NCSU Regulation 10.10.4 and Article II of the NCSU Centers and Institutes Management Guide.

A detailed proposal describing the proposed Center and a letter requesting permission to plan from Mr. Robert S. Foyle, P.E., are included for your review. The proposal has been reviewed by Research Operational Council (ROC) members and received their support. If additional information is required, please let me know.

Your consideration of our request to plan this Center is greatly appreciated. I look forward to your response.

TLL:mh

Enclosure

cc: Mr. Robert S. Foyle, P.E., Interim Director of NextGen Air Transportation Center
Dr. Nagui Roupail, Director of ITRE
Mr. Matt Ronning, Associate Vice Chancellor, Director of SPARCS
✓ Ms. Larisa Oktyabrsky, Coordinator, Centers and Institutes, SPARCS



***Proposal to Request Authorization to Plan the
NextGen Air Transportation (NGAT) Center***

***at the
Institute for Transportation Research and Education
North Carolina State University
Campus Box 8601
Raleigh, NC 27695-8601***

Submitted by:

***Mr. Robert S. Foyle, P.E.
Associate Director, ITRE
NCSU Campus Box 8601
Raleigh, NC 27695-8601
919-515-8580***

June 26, 2008

This is a request to plan the NextGen Air Transportation Center at ITRE. Details are provided below on purpose and need for the center, history to date, mission, goals and objectives, center organization, funding, relation to other centers, initial focus area, and appendices supporting the center concept.

Purpose and Need

The Institute for Transportation Research and Education (ITRE) at North Carolina State University (NCSU), in cooperation with the North Carolina Department of Transportation (NCDOT) Division of Aviation, desires to establish the new *NextGen Air Transportation (NGAT) Center* within ITRE. The NGAT Center is designed as a non-profit partnership of academia, industry, and government created to provide a research and application oriented, technology transfer focused organization for conducting air transportation technology development, investigations and field trials at the pre-competitive level.

The Federal Aviation Administration (FAA) has issued a directive that the aviation user community will be using a space-based air traffic control system by 2020. Through International Telephone and Telegraph (ITT) and Thales, the ground infrastructure will be in place to support this new system by 2012. Converting over to this new system requires special hardware in the cockpit of every aircraft. Pilots need training in the use of the new system, installers need to be trained for proper installation, and users (like the State Highway Patrol and the U.S. Forest Service) need information on how the new system works. There are over 200,000 general aviation aircraft that are impacted by this new system, not including the commercial airliners. FAA is not equipped to provide the support needed for effective implementation of this system. Further, equipment ready for installation is costly (about \$15,000 for general aviation aircraft), and less expensive equipment (for around \$2,000) needs to be developed and tested for reliability for this large population of general aviation aircraft. Commercial airlines will be able to absorb the cost of equipment and pilot training through fuel savings as flight paths become more efficient when the pilot has more control for direct versus circuitous routing of flights, including emergency procedures for problems just after liftoff.

History to Date

This history summary is intended to document the scoping efforts to date for the center.

1. In the Fall of 2006, the NCDOT Division of Aviation approached ITRE about creating an airspace technology center. The Division had previously approached two academic departments on the NCSU campus and discussions ended when no department wanted to administratively run such a center.
2. ITRE decided that the center could launch research and technology transfer activity into air transportation, one mode where very little work had been done by ITRE since its inception. The center would also create national visibility, a key goal for both ITRE and NCSU.
3. A White Paper on the center was prepared and discussed with Dr. Gilligan in March 2007. Dr. Gilligan was supportive of the center concept and was willing to commit funds for travel to D.C. to present the concept to FAA and NC legislative leaders.

4. At the same time, Matt Peterson, Director of Federal Research Affairs, was made aware of the center concept and began discussions with ITRE concerning funding requests to Congress.
5. NCDOT Division of Aviation has kept in continuous contact with representatives at FAA and the North Carolina congressional delegation since spring 2007. All contacted individuals were very positive about the center's value.
6. NCSU ranked the center funding among the top three requests for congressional funding for discussion during the summer 2008 session.
7. NCDOT Division of Aviation provided a seed grant of \$50,000 for one year starting January 2008 to help inaugurate the center's activities and document a number of technology demonstration projects and share the results with the aviation community.
8. ITRE and NCDOT are currently soliciting interest from targeted universities, private companies, and other organizations in participating in the center's activities.

Mission

The Center's mission will include the discovery, evaluation, implementation, and dissemination of advanced air transportation technologies at the regional, national, and international level to improve the capacity, safety and environment surrounding air transportation.

Goals and Objectives

The goal of the center is focusing on developing and evaluating improvements to existing and anticipated: air traffic control, airspace management, airport and airspace system capacity, surface traffic management, and flight safety.

The objectives and expected outcomes for the center include developing and evaluating advanced technology solutions to provide efficient air traffic control and airspace management in the National Airspace System (NAS)—while improving and enhancing air traffic control management, increasing airport and airspace capacity, reducing delays, improving energy efficiency, minimizing environmental impact, managing high-volume surface traffic, and ensuring enhanced flight safety.

Initiative Areas

1. **Research:** The NGAT Center's goal is to become the pre-eminent leader in exploratory research into airspace travel through technology innovation, air and noise quality analyses, and airspace system management. These activities are integral to the long-term success of the center. Air transportation industries along with commercial operators, private aircraft owners, military, forest service, civil air patrol, state highway patrol, the National Guard, and other users will see improvements in safety and efficiency, while ensuring that environmental issues are mitigated.

The success of the center will rely on assembling multidisciplinary teams from departments under the College of Engineering (Civil, Construction, and

Environmental Engineering; Electrical and Computer Engineering; Mechanical and Aerospace Engineering; and Industrial and Systems Engineering) in helping solve critical national and international problems in this area. Faculty from these departments will also team with faculty at other institutions to share and explore critical thinking and research on current and future air transportation issues. Research projects will certainly use graduate students to help conduct the research, thus providing students with vital knowledge about aviation technologies. Future research in air space control technologies could lead to patents, an important goal of the university.

2. Education: The NGAT Center will involve students at both the graduate and undergraduate levels through research and internships. Students may come from NCSU and other partner universities. Students participating in NGAT Center activities will be challenged through innovative, exploratory research and real-world applications of emerging technologies in air transportation. Such experiences will greatly enhance the student's educational curriculum, and will encourage many students to seek careers in the field of air transportation.
3. Technology Transfer: A vital component to the success of the NGAT Center will be documentation and sharing of success stories to the users of the air transportation systems across the country, and throughout the world. The U.S. is a leader in air transportation, and as such, new and important technologies should be shared with the world community. Technology transfer will occur through published research findings, participation in (or hosting) national conferences, creating a resource and repository for information, hosting a web site, and training other universities, partners, and companies in airspace technologies.

Center Funding

The NCDOT Division of Aviation has provided \$50,000 in planning funds to help create the NGAT Center. In addition, ITRE has received verbal commitment for additional start-up travel funds from NCSU to provide sufficient resources for the NGAT Center to begin its operations. These seed funds will enable (a) travel to meet with the appropriate FAA and federal officials, (b) discussion and formulation of partnerships with other entities within and outside North Carolina, and (c) initiating exploratory research efforts.

The NGAT Center will be seeking federal funding (likely through FAA) this summer in the range of \$1-2 million per year for at least five years. This level of funding is consistent with other established FAA Centers of Excellence. Potential industry memberships could generate an additional \$250,000 to \$500,000 per year. Membership fees and operating bylaws have not been established at this time as the focus is on getting federal funding this summer.

2008	\$50,000	(for planning and some startup activities)
2009	\$1,500,000	(assumes federal funding and industry members)
2010	\$2,000,000	(assumes federal funding and industry members)
2011	\$2,000,000	(assumes federal funding and industry members)
2012	\$2,000,000	(assumes federal funding and industry members)
<u>2013</u>	<u>\$2,000,000</u>	<u>(assumes federal funding and industry members)</u>
Total	\$9,550,000	

It is expected that after this period the center will be well-established by demonstrating vital services resulting in a need for continued operations through a combination of federal, state, and industry funding in the range of \$2 million per year.

The operation of the center will not require other university resources on a contribution basis. The center has begun operations with a project grant from NCDOT and will be operating with a positive balance for all activities. If federal funding does not come through this summer, it is expected that another project grant from NCDOT would continue some operations for 2009, with another push for federal funding during 2009. Also, industry memberships and bylaws will be established in the next few months in order to begin possible recruiting of industrial members starting in 2009.

Office Space and Administrative Support

Initially, the NGAT Center will be housed within the existing office spaces at ITRE. Administrative employees are available to provide initial financial oversight and processing of contracts, agreements, and expenses. Once the center receives substantial funding, additional office space will be sought within NCSU (preferably on Centennial Campus) to accommodate the expected additional center staff and activities.

The center operation will require about 2,500 SF when fully funded. Space needs include:

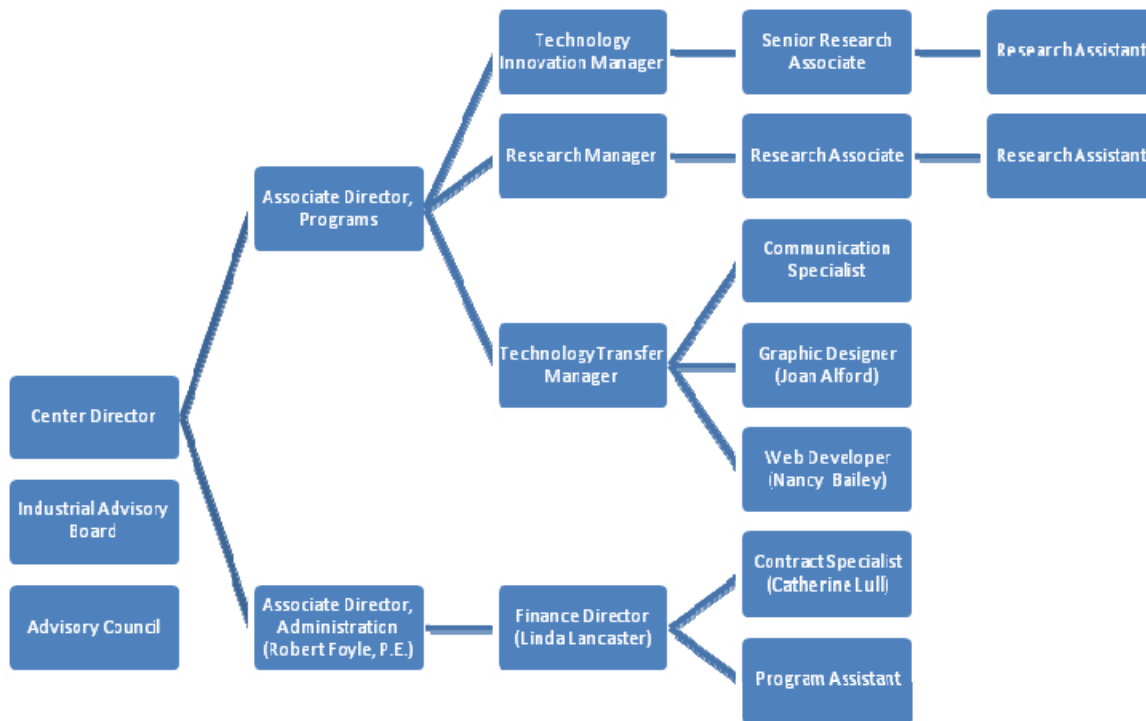
Staff (10), filing cabinets	1,200 SF
Equipment testing area	500 SF
Meeting space	500 SF
<u>Storage area</u>	<u>300 SF</u>
TOTAL	2,500 SF

Space is currently available at ITRE for classroom-style instruction.

Center Management

Robert S. Foyle, P.E., Associate Director of ITRE, will serve as Interim Director until a permanent Director is appointed when substantial funding is secured. Mr. Foyle has been actively involved in the discussions concerning the establishment of the NGAT Center, and he also serves as the P.I. on the seed grant from NCDOT for establishment of the center. Mr. Foyle has also been involved in viewing the demonstration projects to date on implementing ADS-B aircraft surveillance.

The center staff and advisory groups will be organized as follows:



Named individuals are employees already staffed at ITRE. Their involvement will fulfill some partial time commitments in support of center activities (perhaps 20-40 percent of time in any given month). Other positions are new and are anticipated to be full-time positions devoted 100 percent to center activities. The Industrial Advisory Board (IAB) will be created from industry partners contributing membership dollars into the center. Industry partners will then have a seat on the board, and will help direct membership funding into specific project activity. The Advisory Council (AC) will include both public and private membership to help govern other center activities and provide oversight and support on achieving the center goals while meeting NCSU’s mission and objectives.

The center director and two managers will work closely with the IAB, Advisory Council, and faculty within NCSU and at other universities to engage all individuals in the center activities. Faculty will be encouraged to engage graduate and undergraduate students in research projects of interest, with the potential for some new patents to come from the research.

ITRE and the NC Division of Aviation are actively seeking partners for the center. To date, two letters of interest have been received. Partnerships are being sought from the following universities, companies, and organizations. Formal letters of intent have been received from those marked with an asterisk and highlighted in red.

University partners:	University of Iowa Ohio University Florida Inst. of Technology University of South Dakota MIT Mississippi State University	Texas A&M University of Kansas University of Nebraska, Omaha Hampton University Embry Riddle Aero University Virginia Tech
Service providers:	DayJet SATSair NetJets Atlantic Aero Eastern Aviation	SeaAir United Air Lines Linear Air FedEx The Burr Group
Aircraft manufacturers:	Eclipse Cessna Boeing	Honda Jet Hawker Beechcraft Lockheed Martin
Avionics:	Garmin Thales ATM S-TEC Adaptive Aerospace Group* Max-Viz Aspen Avionics Athena Barco Jeppesen	ITT Mitre CAASD SAIC Rannoch Blue Rock R&D Mercury Computer Systems Rockwell Collins ARINC Goodrich
Others:	Pacific Asia Travel Assoc. NC Army National Guard Naval Air Systems Command NC State Highway Patrol*	Aircraft Owners and Pilots Assoc. General Aero Company* US Dept. of Homeland Security Naval Surface Warfare Center

Relation to Other Centers and Activity at NCSU and other UNC Campuses

As of the date of this submittal, there are no current active CILS at NCSU that have a related activity to the NGAT Center. Further, there are no CILs approved for planning at NCSU, nor are there any Inter-institutional Centers with related activity to the NGAT Center. However, Dr. Chris S. Brown, Assistant Vice Chancellor for Research Development, and Mr. Foyle have recently communicated about efforts Dr. Brown has underway to create an aviation and aerospace center at NCSU. The focus of the two centers is different and it appears there is little, if any, overlap in either center’s activities for at least the near-term (2-4 years). It may be that as each center matures, there could be cooperating efforts or perhaps the need to create a larger center or institute to house both center’s activities under one entity. This will need to be worked out pending future funding and activities at each center.

The NGAT Center is similar to the Centers of Excellence (COE) currently administered within the FAA COE Program (Appendix A). However, a critical component of the new NGAT Center is its clear focus on technology transfer. This emphasis dovetails nicely with



a major strength of ITRE, one that has been developed with the involvement of ITRE in the Center for Transportation and the Environment and previously with the Southeastern Transportation Center. In fact, in each of the past three years ITRE has provided technology transfer services to over 10,000 participants. The importance of being able to disseminate information efficiently and effectively is clear, and yet to date this has not been emphasized in the FAA Centers of Excellence network.

ITRE is requesting permission to plan the NGAT Center under the auspices of the Office of the NC State University Vice Chancellor for Research (ITRE's direct report office). This designation makes a strong case for focusing all air transportation management technology development, evaluation, and field trials conducted by faculty at NCSU, and any potential work at other UNC system universities, through the NGAT Center in anticipation of receiving future funding from other sources, both government and industry.

Initial Focus of the NGAT Center

Initially, the NGAT Center will focus on technologies that offer the opportunity for significant improvements in the area of air traffic control and aviation safety. The FAA has announced its intent to develop a next generation (NextGen) air traffic control system for the United States National Airspace System (NAS) which will be based on the proven technologies of Automated Dependent Surveillance-Broadcast (ADS-B). ADS-B (<http://www.adsb.gov/>) is a GPS-based, linked system, which enables pilots in equipped aircraft to visualize, in real time, current traffic activity pertinent to their location, weather situations provided by ground based radar, and proximity to ground and hazards to flight. Capacity and safety benefits of ADS-B are detailed in the attached Appendix B.

The NCDOT Division of Aviation has been a leader in the initial deployment of ADS-B within the United States and has a full and complete understanding of the technology and its potential uses. Mr. William H. (Bill) Williams, Jr., Director of the Division, was formerly head of the FAA Aviation Standards Division, and is particularly well versed in both the need for upgrading the current systems and the potential of the technology, and also maintains contacts with principals at the FAA. Recent conversations with these FAA leaders have confirmed their interest in and the need for a center to develop, evaluate, and field test NextGen airspace system technologies and particularly to accelerate the effective application and implementation of ADS-B technology.

What Makes the Center Unique?

Initially, the NGAT Center at ITRE will focus on technologies that support ADS-B, and look to improve upon and accelerate the application of the technology in its designed purpose as well as in other possible applications. Since the FAA has designated ADS-B as the basis for the next generation of air traffic management, the FAA has expressed an interest in supporting a center that will study the uses of ADS-B technology and that can help both develop and troubleshoot the technology that millions of people will be depending on for flight safety.

North Carolina is the first state in the nation to have statewide coverage of ADS-B. As a leader in this technology, the NCDOT Division of Aviation is in an excellent position to

provide support to ITRE in its efforts directed at NextGen Air Transportation. North Carolina State University, with its outstanding aerospace program and close ties to NASA, is ideally positioned to provide support and well-educated graduate students to strengthen the program. Furthermore, providing leadership for such a center is well within ITRE's mission and capabilities, as it continues to manage a similarly federally-funded center, the Center for Transportation and Environment (CTE), which has been in operation for over ten years. Other outstanding educational institutions have expressed interest in joining, and leaders in aviation technology from the industry have also expressed their desire to be part of this center focused on air transportation technology, with a priority effort on urgent improvements in airspace management and aircraft operations.

Why ITRE and North Carolina?

There are many unique circumstances and synergies that surround the development of this center that will foster a multiplication of individual contributions. The organizational structure of ITRE with its experience in transportation research and education (see Appendix C - summarizing a recent aviation-related research study carried out at ITRE); the involvement of the NCDOT Division of Aviation with the initial foray into ADS-B operational activity; the interest and investment of the FAA in the technology; the contribution of the NCDOT Division of Aviation in leading the North Carolina & Upper Great Plains Small Aircraft Transportation System Laboratory (NC&UGP SATSLab) - a very productive partner in NASA's recently completed SATS Program; and the close ties between Mr. Bill Williams and the NCDOT Division of Aviation with the FAA and NASA all point to the successful establishment and operation of a very effective and productive NGAT Center.

It is safe to say that the NCDOT Division of Aviation knowledge base regarding ADS-B technology is as extensive as anywhere in the country. North Carolina was the first state in the nation to have statewide coverage of the service, and has worked closely with the FAA and NASA to provide clear examples of the benefits of this technology to the industry. A fleet of ADS-B aircraft in North Carolina has already been equipped and representatives of the Division of Aviation deliver monthly briefings across the state displaying the technology and informing pilots about the system. The division has worked closely with the avionics industry in the development and application of the hardware and has excellent relations with industry leaders.

APPENDIX A

FAA Centers of Excellence Program

The FAA has established a Centers of Excellence Program. The centers contained within this program are defined by the FAA as entities with substantive, continuous ties to the universities which, in the university context, advance the state of transportation knowledge within a particular area, or areas, of concentration and contribution. Such a center prepares individuals with transportation skills for career service in the functional areas of transportation in which it specializes.

There are currently seven FAA Centers of Excellence (COE). These centers address such issues as Airliner Cabin Environment, Noise and Emissions Mitigation, Operations Research, Airworthiness Assurance, Advanced Materials, General Aviation, and Airport Technology. The only North Carolina institution of higher education involved in an FAA COE at this time is North Carolina A&T State University, a participant in the Airport Technology Center of Excellence, which is led by the University of Illinois. (See the following Web site for more information: <http://www.coe.faa.gov/> .)

Existing FAA COEs typically receive between \$1-2 million per year of federal funding for operations. Some centers have received higher amounts for specific initiatives to be accomplished within short time frames (1-2 years).

APPENDIX B

Operational Details and Benefits of ADS-B

The effect of an installed ADS-B system in the cockpit provides a major improvement in situational awareness. A monitor displays all air traffic, including aircraft type, speed, direction of travel, and altitude relative to the aircraft, as well as weather data and other safety related information. All non-ADS-B-equipped aircraft can only obtain this information verbally from air traffic controllers on the ground, and only when the pilot requests this information or if a safety alert exists. The ADS-B system in the aircraft is updated every second. This is done via a link to the ground based transceiver, which is connected via a high speed line to the central database. The ADS-B equipped aircraft updates the database with its location, direction and speed provided by a GPS system in the aircraft. This information is provided directly to other ADS-B equipped aircraft within range as well as the ground based transceiver, and the database sends back updated information that has come in from other aircraft, as well as weather information provided by the National Weather Service including radar signals and forecasts.

Improvement in safety is the first result of this system. Aircraft pilots will be able to expand their knowledge of their surroundings without having to depend on intervention by air traffic controllers. Avoidance of other aircraft, inclement weather, and ground obstacles is made easier by having the information provided visually inside the aircraft.

As this program expands to include all aircraft, increases in capacity, both on the ground and in the air, are possible. The current system of air traffic control relies upon routing aircraft along established airways, which act like highways in the sky. The ADS-B system, with its increased situational awareness benefits, will allow aircraft to fly directly from one point to another, avoiding the congestion of the airways as they exist today. And because the system is as accurate on the ground as in the sky, tracking other aircraft movements at the airport will be improved, allowing more efficient ground operations, increased capacity, and enhanced safety.

The ultimate result of these improvements will be increased safety, efficiency, and economy for the overall aviation system. By avoiding requirements to fly established airways and being vectored off the direct course, aircraft will fly the shortest route, saving time and fuel, as well as reducing environmental impact. By monitoring other aircraft movements around them, pilots will be able to avoid congestion and more efficiently operate the aircraft. UPS, one of the developers of this system, has equipped its cargo aircraft that operate in and out of the Louisville, Kentucky airport. By monitoring the activity of the other UPS aircraft that fly into this huge hub and maintaining the required distance spacing between each aircraft, the company's aircraft save more than 800 pounds of fuel each night compared to the operation before ADS-B implementation. This amounts to a yearly savings of 292,000 pounds of fuel (about 43,600 gallons of fuel or about \$130,800 per year in savings).

APPENDIX C

Joint ITRE-NC DOT Study on Benefit Cost of Aviation in NC

A recent study titled “2006 Economic Impact of Aviation in North Carolina” completed by the Division of Aviation and ITRE documented the outstanding growth that has occurred in the General Aviation (GA) field of aviation over the past ten years. In that span of time, North Carolina GA activity has grown ten-fold, from \$180 million in 1996 to \$1.8 billion in 2006. Commercial service activity and economic impact continues to grow, also, but not at the same pace.

The future of General Aviation continues to be very bright. Advancements in airframe construction, engine design, controls and electronics, and navigation and communication avionics technology continue to make flying safer and more efficient, bringing more and higher performing equipment into the National Airspace System at a time when the current ATC system has reached its saturation point.

The FAA’s need for a new generation of ATC and ATM has been made clear. The time for establishing a Center for NextGen Air Transportation focused on research and technology implementation is now, and ITRE, NCSU, the NC Division of Aviation, the FAA, NASA, the Air Transportation Industry and other partners are well positioned for forming a partnership that bolsters aviation safety, reduces fuel usage and environmental impact, and responds to the needs of the nation’s air travelers.