



Kansas Aviation Research and Technology Growth Initiative

FY15 Final Report

January 2016

Kansas Aviation Research & Technology Growth Initiative

21st Century Aviation

FY15 Final Report

PROGRAM OVERVIEW

The Kansas Aviation Research & Technology Growth Initiative uses funds provided by the the Kansas Legislature with the goal of strengthening a variety of aircraft industry technologies and marketing them to other areas outside the State of Kansas and the United States. This funding used in this program supports the retention and growth of over 30,400 direct aerospace jobs and 118,894 indirect jobs as a result of the aerospace industry with an average wage of \$67,440, a total direct payroll of \$2.3 billion and an indirect payroll of \$5.2 billion. The Kansas Aviation Research & Technology Growth Initiative will help retain and grow the aviation cluster in Kansas and help Kansas aviation companies remain competitive throughout the 21st century.

In order to maintain a focus on the needs of the aviation industry in Kansas and address the requirements necessary for economic growth, this program is executed by members of the aviation industry. An industrial executive committee has been formed comprised of membership from the four large aviation companies in Wichita (Airbus, Bombardier Learjet, Spirit AeroSystems and Textron Aviation). The program is focused on two major areas: (1) advanced research projects directed towards reducing cycle time-to-market, reducing manufacturing costs, enhancing quality and safety for improved competitiveness, and retaining and (2) creating jobs in Kansas and infrastructure improvements at the National Institute for Aviation Research (NIAR) to enable research and technology advances within the research and development environment. The program budget requires a 1:1 matching requirement with the matching funds being generated from industry, university and/or philanthropy.

Kansas is also home to a unique worldwide composites and advanced materials cluster that is not commonly recognized. A “cluster” has been defined as a “geographic concentration of interdependent companies, institutions and partnerships that together create competitive advantages due to co-location.” Components of the cluster can include raw materials producers, equipment manufacturers, fabricators, end-users, engineering and design services, logistic providers, workforce development organizations, educational institutions, public-private partnerships, research and development centers, technology transfer facilitators, venture capitalists and other financiers and business service providers.

NATIONAL INSTITUTE FOR AVIATION RESEARCH AT WICHITA STATE UNIVERSITY

The National Institute for Aviation Research (NIAR) at Wichita State University (WSU) is dedicated to helping the Kansas aviation industry maintain a strong competitive position in world aviation markets. NIAR’s mission is to conduct research and transfer technology for the U.S. aviation industry and for

federal agencies that support aviation safety. NIAR research and development is directed to new or improved techniques; product development processes; experimental databases for design, development and certification; and software for design, development and product realization. These research and development products result in reduced costs and/or increased revenues to the aviation industry in the design, development and manufacturing of commercial products.

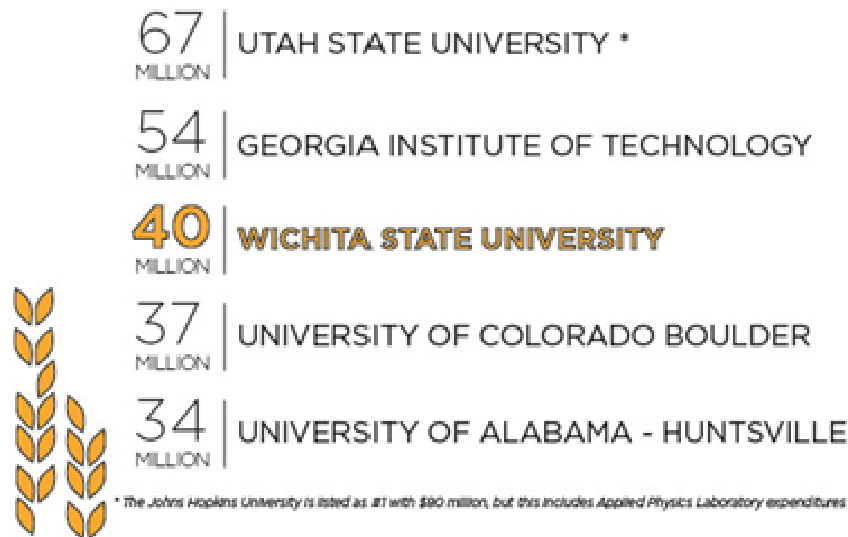
NIAR's ten thrust areas encompass 320,000 square feet of laboratory and office space. Major thrust areas for the Institute are composites and advanced materials, structures/fatigue, aging aircraft, advanced joining, CAD/CATIA, aerodynamics, full-scale testing, crashworthiness and environmental testing which are spread across nine locations primarily in south central Kansas.



NIAR's research expenditures have increased steadily since 1995; in fact, WSU/NIAR ranks third among all U.S. universities in aeronautical engineering research expenditures and first in industry-financed aeronautical engineering research expenditures.

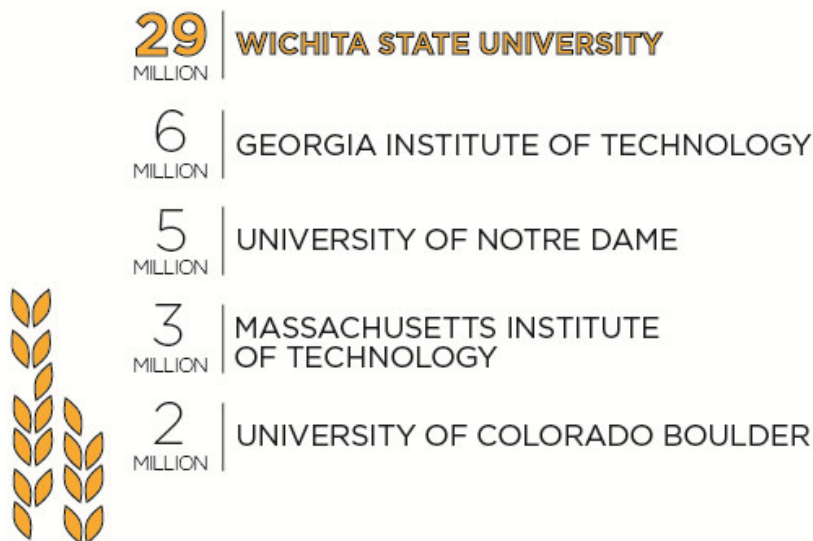
AERO R&D EXPENDITURES

Source: National Science Foundation Higher Education Research and Development survey 2014



INDUSTRY FINANCED AERO R&D

Source: National Science Foundation Higher Education Research and Development survey 2014



PROGRAM OUTLINE

The program outline for the Kansas Aviation Research & Technology Growth Initiative follows the guidelines and procedures that have been utilized under previous aviation funding supplied by the

State of Kansas. Specific program protocols were developed that enabled the aviation industry to collaborate on some of their most pressing research and technology. The new Kansas Aviation Research & Technology Growth Initiative uses these highly successful principles to guide the new program to help Kansas aviation companies remain competitive throughout the 21st century.

The program is executed by members of the aviation industry tasked to maintain a focus on the needs of the aviation industry in Kansas and address the requirements necessary for economic growth. This industrial executive committee is comprised of membership from the four large aviation companies in Wichita: Airbus, Bombardier Learjet, Spirit AeroSystems and Textron Aviation. The executive committee communicates industry needs and recommends research projects based on those needs to be undertaken by the Kansas Aviation Research & Technology Growth Initiative program at NIAR for research and for technology transfer into commercialization endeavors. The committee establishes budgets for projects, evaluates current projects to determine whether to continue, re-direct, or terminate them, and prioritizes proposed projects for future consideration. A membership agreement between each aviation company and WSU/NIAR has been initiated as part of the organization of this program.

PROGRAM BUDGET

Based on the funding provided and approved by the Kansas legislature, projects were selected to address specific areas of need within the local aviation industry with focus on reducing cycle time-to-market, reducing manufacturing costs, enhancing quality and safety for improved competitiveness, and retaining and creating jobs in Kansas. In addition, funding was allocated for specific infrastructure upgrades and equipment needed to enable research and technology advances within the research and development environment and to ensure NIAR maintains a leadership role within the future 21st century aviation research centers.

The program budget requires a 1:1 match with matching funds being generated from industry, university and/or philanthropy. The required 1:1 cost matching is provided as seen in tables on pages 15 and 16. Each project is matched with funds that are similar in nature to the projected funding by the State of Kansas. For example, a project dealing with the research of composite materials is matched with a similar project funded by the private sector. Similarly, an infrastructure project is matched by like infrastructure funding from university or philanthropy funding.

PROGRAM PROTOCOL PROCEDURES

The protocol that the aviation industry executive committee follows was based upon each industrial representative presenting 4-5 high priority research projects within their company and sharing with the total group. These projects were summarized in a combined list and discussed among the executive committee to determine which projects have overlap and may be combined, which projects bring the highest return on investment (from providing the greatest competitive advantage for the Kansas aviation cluster) and which projects could achieve specific goals in the required time frame. Budgets are also designated for each project. Based upon the funding provided by the State legislature, the project listing is trimmed or rescaled to fit within the Kansas Aviation Research & Technology Growth Initiative budget year as well as the allowable funding.

Fiscal Year 2015 Research Projects

The appropriation from the Kansas Department of Commerce totaled \$5,000,000 for research project and equipment/infrastructure upgrade funding. The aviation industry awarded research project funds among individual budgets for 16 projects as follows:

Project	Title	PI	FY15 Funding
R51131	Repair of Composite Structures (including sandwich)	Salah	\$800,000
R51132	Thermoplastic Characterization and Testing	Aldag/Seneviratne	\$200,000
R51133	Electromagnetic Characterization of Composite Fuselages	Jonas	\$100,000
R51134	Effects of Manufacturing Defects on Composites Materials (NDI Development)	Aldag	\$125,000
R51135	Wet Wing Lightning protection Design Handbook/Structural Fastener Design Database	Martin/Yulia	\$250,000
R51136	Low IR absorbing pigments	Hunt	\$75,000
R51137	Damage Growth of Fluid Ingression in Sandwich Panels	Seneviratne	\$150,000
R51138	Aerodynamics and CFD	Laffen	\$150,000
R51139	Utilization of Aramis for 3D Strain Mapping	Seneviratne	\$50,000
R51140	Surface Modification Methods for Bonded Repairs of Composite Structures	Salah	\$150,000
R51141	Reverse Engineering of Composite Repairs	Jonas	\$150,000
R51142	EU Material Targets - REACH Compliance	Aldag	\$150,000
R51143	Repair Monitoring with Discrete/Wireless Sensors	Raju	\$180,000
R51144	Foundations for Composite Fuselage Repair Methods	Seneviratne	\$180,000
R51145	Simulate and Predict Failure Strengths and Allowables Development Process of Composites	Seneviratne	\$200,000
R51146	Infrastructure	Tomblin	\$2,040,000
R51147	ADMIN	Tomblin	\$50,000
			\$5,000,000

Project Descriptions

FY15 work has been completed and funds are expended or in final processing. The Final FY15 KART Expenses and Grant Balances Report is not yet available from the WSU Office of Research and Technology Transfer; the December 31, 2015 financial information is included on page 8 of this report. As noted below, a number of projects will continue into FY16 with State funds awarded into the WSU budget.

Repair of Composite Structures (including sandwich)

Composite structures can be damaged during construction, maintenance, or by normal use. This project evaluates the effects of several variables on the strength and durability of bonded repairs applied to laminates and sandwich structures.

100% of the FY15 project award has been expended. Additional tasks in this area have been approved by the Executive Committee for an FY16 project with the same title.

Thermoplastic Characterization and Testing

Applications on primary structures require rigorous material characterization including quality assurance and durability investigation. This project investigates the structural integrity of banded joints during operation.

100% of the FY15 project award has been expended. The Executive Committee did not have additional tasks to assign and did not approve an FY16 project.

Electromagnetic Characterization of Composite Fuselages

Analytic tools are available for predicting the indirect effects of lightning and can be used by aircraft designers to show compliance to FAA requirements while eliminating the need for expensive and extensive testing. While extensive and detailed modeling is often required, there is also a need for a simpler model to be used for initial design decisions. This project will focus on characterization of currents and voltages on complex wire harnesses including shielded wires, and mitigation of both currents generated on major internal conductors and currents in the primary fuselage.

100% of the FY15 project award has been expended. Additional tasks in this area have been approved by the Executive Committee for an FY16 project with the same title.

Effects of Manufacturing Defects on Composites Materials (NDI Development)

Applications of composite materials in very large, primary structures are becoming commonplace however, defects occurring during the lay-up and cure cycles result in significant rework or worst case, scrap of a part. Understanding the criticality of defect size and density on strength and fatigue properties has the potential to improve manufacturing time and part quality. This project consists of

two parts: 1) evaluation and calibration of NDI techniques for determining porosity and 2) understanding the effect of porosity on strength and fatigue properties.

100% of the FY15 project award has been expended. Additional tasks in this area have been approved by the Executive Committee for an FY16 project with the same title.

Wet Wing Lightning Protection Design Handbook / Structural Fastener Design Database

There is a need for establishing standardized FAA-approved guidelines guaranteeing successful certification of wet wing fuel tanks against effects of lightning. This project proposes to develop a documented database of fastener sparking thresholds for commonly utilized fastener types, materials, and structural configurations for both normal and fault conditions installations. The methodology developed within this program for a metal wing will further serve as a foundation for certification of composite airframes.

100% of the FY15 project award has been expended. Additional tasks in this area have been approved by the Executive Committee for an FY16 project titled "Development of Fuel Tank Lightning Protection Design Handbook."

Low IR Absorbing Pigments

Aircraft manufacturers have limited use of darker paint colors on upward facing surfaces, especially on composite structures due to the damaging effects of increased surface temperatures caused by infrared energy absorption from exterior exposure. This project will begin evaluation of available technologies for lowering thermal energy build-up on exterior aircraft surfaces.

100% of the FY15 project award has been expended. The Executive Committee did not have additional tasks to assign and did not approve an FY16 project.

Damage Growth of Fluid Ingression in Sandwich Panels

Fluid-ingression phenomenon in composite structures is a concern for sandwich structural details. Inadequate design details and/or poor material selections can result in microcracks that lead to moisture ingression. In addition, impact damage on sandwich structures can exacerbate fluid-ingression as a result of localized cracks, delaminations, disbonds, and core damages. This project will examine the influence of sandwich parameters and the influence of fluid ingression on the onset and damage growth rate of sandwich composites. The project will also identify test methodology for determination of fracture toughness and damage growth rates and will perform comprehensive failure analysis of sandwich test specimens.

100% of the FY15 project award has been expended. Additional tasks in this area have been approved by the Executive Committee for an FY16 project with the same title.

Aerodynamics and CFD

Wind tunnel testing has been the standard method for investigation of aerodynamics for more than a century. The recent demands for higher resolution, accuracy, and repeatability in aerodynamic testing have lead to the use of Computational Fluid Dynamics (CFD) methods in addition to traditional wind tunnel tests. This project will compare and integrate design and test methodologies from wind tunnel testing and CFD to solve common challenges expressed by industry.

100% of the FY15 project award has been expended. Additional tasks in this area have been approved by the Executive Committee for an FY16 project with the same title.

Utilization of Aramis for 3D Strain Mapping

ARAMIS digital image correlation system is a non-contact optical 3D deformation measuring system. The non-destructive inspection of airframe components is a critical step in the manufacturing processes of airframe structures and the detection and quantification of flaws detrimental to the safe operation of the airframe under service loads, in a reliable and timely manner is crucial to the aviation industry. The choice of non-destructive inspection (NDI) technique is dependent on several variables. In this investigation, the capabilities of the Photogrammetry techniques will be reviewed for their potential use for non-destructive inspections and strain mapping of large scale aircraft structures. These methods will be used to detect and quantify characteristic flaws in metallic and composite coupons and will also be used to detect flaws in a composite aircraft parts. The results of this project will provide insight into the suitability of the photogrammetry and ESPI methods for NDI purposes

100% of the FY15 project award has been expended. Additional tasks in this area have been approved by the Executive Committee for an FY16 project with the same title.

Surface Modification Methods for Bonded Repairs of Composite Structures

Weak interfacial bonds between composite adherends are not detectable with the current NDI methods and may deteriorate in service possibly leading to failure of the repaired component. This project will investigate the effects of surface modification methods (atmospheric pressure plasma, laser surface ablation, corona treatment, and flame treatment) on the long term durability of bonded repairs.

100% of the FY15 project award has been expended. The Executive Committee did not have additional tasks to assign and did not approve an FY16 project.

Reverse Engineering of Composite Repairs

This project will develop the reverse engineering repair process to develop a portable field ready solution. Tasks may include: developing and validating the system on complex contours and hardware, investigating and developing a hardware solution and specifications, identifying user interface requirements, selecting a hardware solution and investigating a partnership with a hardware/software supplier.

100% of the FY15 project expenses are still being processed. The Executive Committee did not have additional tasks to assign and did not approve an FY16 project.

EU Material Targets – REACH Compliance

Researchers will scan the candidate list of targeted chemicals before enacted into EU regulatory status and provide industry with potential alternate paths. This work has the potential to benefit all local industry.

100% of the FY15 project expenses are still being processed. Additional tasks in this area have been approved by the Executive Committee for an FY16 project with the same title.

Repair Monitoring with Discrete/Wireless Sensors

The measurement and control of process temperature for curing of composite parts and repair patches are typically accomplished using surface mounted thermocouples. The measurements from the thermocouples are reflective of the surface temperatures rather than that in the interior, which could lead to non-uniform curing of the part as well as associated thermal stresses. In this project, the suitability of using microwire temperature sensors for repair applications in laminate composite airframe structures fabricated using Cytac Cycom 5320 system (unitape and fabrics) will be experimentally investigated.

100% of the FY15 project award has been expended. Additional tasks in this area have been approved by the Executive Committee for an FY16 project with the same title.

Foundations for Composite Fuselage Repair Methods

Mechanically fastened joints are widely used in aircraft applications due to decades of usage history, validated analytically techniques, ease of inspection and repair, etc. and many programs have investigated the use of mechanical fastening of composite joints. This project evaluates several bolted and bonded techniques for composite fuselage repair, primarily to contain a large delamination, and produce benchmark analysis models and develop a proof of concept methodology for hat stiffener repair technique.

100% of the FY15 project expenses are still being processed. Additional tasks in this area have been approved by the Executive Committee for an FY16 project with the same title.

Simulate and Predict Failure Strengths and Allowables Development Process of Composites

There are a variety of modeling practices currently in use for predicting the strength of composite laminates and improved predictive methodologies for damage tolerance of structures are one of the key needs for both commercial and defense composite aerospace applications. This project will use increased simulation to predict failure strengths of composites and to simulate the entire allowables development process so that one can trade off risk versus the amount of money spend on testing.

100% of the FY15 project expenses are still being processed. Additional tasks in this area have been approved by the Executive Committee for an FY16 project with the same title.

21% of the FY15 project expenses are still being processed. Additional tasks in this area have been approved by the Executive Committee for an FY16 project with the same title.

Infrastructure

Infrastructure investments were also one of the main goals of the KART program. These investments within the research and development environment continue to ensure NIAR maintains a leadership role within the future 21st century aviation research centers and enables Kansas to be a world leader in the international aviation supply chain. For FY15, infrastructure investments included both facilities upgrades and equipment acquisitions/upgrades including: Marx Generator; Ultra high speed video, infrared camera, test fixtures material; Coliseum infrastructure; engineering design studio; crash laboratory upgrade; composite high temperature testing capability; Bird strike physical test facility; burn testing; Altitude/temperature/humidity chamber; and enhanced DO-160 capability.

Environmental and Electromagnetic Effects

Many of the infrastructure improvements involved enhanced capabilities for NIAR's new full service Environmental and Electromagnetic Effects (EME) Lab at Air Capital Flight Line (formerly Boeing property). Additions to the EME Lab included the marx generator of high voltage swept stroke testing; burn testing equipment; a new altitude/temperature/humidity chamber; and additional equipment for DO-160 testing. The new facility is staffed and equipped to create simulated environments for the research and testing of equipment and components for aircraft, automotive, medical and other industries to determine their susceptibility to extreme environments and operating conditions.



Aircraft Structural Test and Evaluation Center

Additional infrastructure improvements included the addition of a second client viewing room and additional client and employee work and meeting spaces at the Aircraft Structural Test and Evaluation Center (ASTEC).

Also at ASTEC, a new Bird-Strike test facility is under construction next to the existing Ballistic and Impact Dynamics Lab. The bird-strike test lab will share a control room with the Ballistics Lab and allow companies to determine the impact of bird-strike on aircraft components.

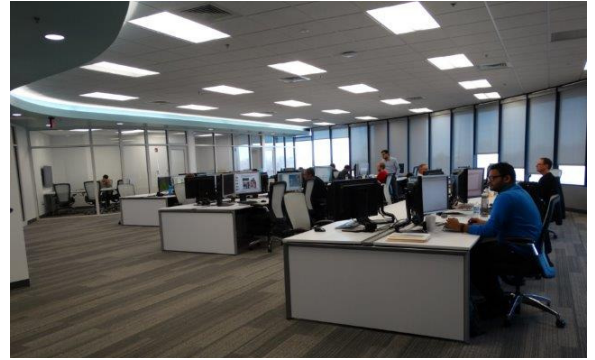


It is designed to accommodate two-, four-, and eight-pound bird weights or client specified gel packs. The range can accommodate large and small airframes and is expected to be operational in the first quarter of 2016.

Engineering Design Studio

On the Wichita State campus, a new engineering design studio was added on the third floor of the NIAR building. The studio, which overlooks construction on the new Innovation Campus, is home to the quickly-growing Computational Mechanics Lab, which will work with many of WSU's innovation partners.

The lab provides research focused in the development and application of numerical methods in areas of Crashworthiness; Injury biomechanics; Structures; Numerical optimization techniques; Virtual product development; and Certification. It employs ten full-time research engineers, seven graduate research assistants and five undergraduates.



Yearend Program Budget Status

As of the financial report through December 2015, the program had expended 100% of the project awards and 79% of the equipment funds. As of the financial report through June 30, 2015, a total cost matching of \$16,469,488 has been recorded for the program year.

Executive Budget Status Summary

The table below shows the expenditures as well as the cost matching as of June 30, 2015. It should be noted that the actual expenditures have a 30-45 day lag before being posted to the official accounting system.

Category	Gov't Award Funds (expended to-date)	Cost Match (expended to-date)
Industry Research Programs	<i>\$2,943,274</i>	<i>\$ 15,555,606</i>
Infrastructure and Equipment Upgrades	<i>\$ 1,602,678</i>	<i>\$ 913,882</i>
TOTAL	<i>\$4,545,952</i>	<i>\$16,469,488</i>
Cost Match Ratio	<i>1 : 3.6</i>	

**KART Program
FY15 Cost Share
Capital Assets
Reporting Period: Qtr-4: 04/01/15 to 06/30/15**

NIAR Labs	KART FY15 Proposed Cost Match Budget	Actual NIAR FY15 Capital Expenses For KART Cost Match (See Note-1)				Total Actual FY15 Cost Match	NIAR Actual FY15 to Proposed Cost Match
		Quarter-1	Quarter-2	Quarter-3	Quarter-4		
Environmental Test Lab	\$ 6,000.00	\$ 18,391.17	\$ 7,520.36	\$ 7,900.86	\$ 20,421.76	\$ 54,234.15	\$ 48,234.15
Composites & Structures	200,000.00	180,270.29	68,444.14	47,997.18	133,794.43	430,506.04	230,506.04
CAD/CAM	10,500.00	10,077.39	11,115.45	545.98	4,450.36	26,189.18	15,689.18
Crash Dynamics Lab	1,000.00	0.00	5,632.55	15,515.53	137,625.56	158,773.64	157,773.64
Full Scale Structural Test Lab	200,000.00	44,092.93	32,613.00	27,710.61	42,351.00	146,767.54	(53,232.46)
Computational Mechanics	5,000.00	8,069.06	12,133.71	7,179.96	841.75	28,224.48	23,224.48
Wind Tunnel	10,000.00	26,717.85	10,408.71	0.00	16,620.72	53,747.28	43,747.28
Metrology Lab	7,500.00	3,927.60	7,515.51	961.34	3,034.80	15,439.25	7,939.25
Totals	\$ 440,000.00	\$ 291,546.29	155,383.43	107,811.46	359,140.38	\$ 913,881.56	\$ 473,881.56
Percent of NIAR FY15 Actual Capital Expenses to FY15 KART Budget		66.3%	35.3%	24.5%	81.6%	207.7%	

**KART Program
FY15 Cost Share
Industry Revenue Received
Reporting Period: Qtr-4: 04/01/15 to 06/30/15**

KART Matching Funding Category	NIAR Laboratories	KART	Actual NIAR FY15 Industry Revenue Received				Total Actual FY15 Cost Match	NIAR
		FY15 Proposed Cost Match Budgets	For KART Cost Match					Actual FY15 to Proposed Cost Match
			Quarter-1	Quarter-2	Quarter-3	Quarter-4		
Composite Material Research	Composites	\$ 1,780,000.00	\$ 568,890.76	\$ 1,312,031.18	\$ 1,510,991.07	\$ 1,880,656.42	\$ 5,272,569.43	\$ 3,492,569.43
Advanced Material Characterization	ASTEC	900,000.00	541,494.00	1,811,952.00	880,777.00	441,148.50	3,675,371.50	2,775,371.50
Aerodynamics	Walter H. Beech Wind Tunnel	150,000.00	30,042.00	63,528.00	20,700.00	59,765.40	174,035.40	24,035.40
Modeling & Simulation	CadCam, CompMech	580,000.00	728,749.91	749,500.86	1,011,708.54	744,972.47	3,234,931.78	2,654,931.78
Protection from Environmental Effects	Environmental Test, Advanced Coating, Aging Aircraft Research, Metrology	525,000.00	117,068.51	687,822.71	539,503.41	1,103,402.46	2,447,797.09	1,922,797.09
Crashworthiness	Crash Dynamics	90,000.00	88,825.00	248,808.00	261,400.00	151,868.00	750,901.00	660,901.00
Totals		\$ 4,025,000.00	\$2,075,070.18	\$4,873,642.75	\$4,225,080.02	\$4,381,813.25	\$15,555,606.20	\$11,530,606.20
Percent of NIAR FY15 Actual Revenue to FY15 KART Budget			51.6%	121.1%	105.0%	108.9%	386.6%	

KART Research Program FY 2015
EXPENSES AND GRANT BALANCES THROUGH DECEMBER 31, 2015

	Grant	Fund	Total Budget	Total Expenditure	Total Balance	Expenditures in Process	Total Incl. Expenditures in Process	Net Balance	% of Funds Expended
Tomblin/Salah/Yang	R51131	R51131	815,976	815,974	2	-	815,974	2	100%
Aldag/Waruna	R51131	R51132	199,984	199,984	-	-	199,984	-	100%
Jonas	R51131	R51133	100,000	100,000	-	-	100,000	-	100%
Aldag/Loo	R51131	R51134	124,990	124,990	-	-	124,990	-	100%
Kostogorova/Martin	R51131	R51135	250,576	250,576	-	-	250,576	-	100%
Hunt	R51131	R51136	74,952	74,952	-	-	74,952	-	100%
Tomblin/Seneviratne/Palliyaguru	R51131	R51137	149,997	149,997	-	-	149,997	-	100%
Tomblin	R51131	R51138	143,112	143,112	-	-	143,112	-	100%
Tomblin/Seneviratne/Palliyaguru	R51131	R51139	49,998	49,998	-	-	49,998	-	100%
Tomblin/Salah	R51131	R51140	149,908	149,908	-	-	149,908	-	100%
Jonas	R51131	R51141	150,000	150,000	-	-	150,000	-	100%
Aldag	R51131	R51142	149,930	149,930	-	-	149,930	-	100%
Keshavanarayana	R51131	R51143	176,325	176,325	-	-	176,325	-	100%
Tomblin/Seneviratne/Palliyaguru	R51131	R51144	179,994	179,994	-	-	179,994	-	100%
Tomblin/Seneviratne	R51131	R51145	199,997	199,997	-	-	199,997	-	100%
Infrastructure/Tomblin	R51131	R51146	2,040,000	1,537,664	502,336	65,618	1,603,282	436,718	79%
Admin/Tomblin	R51131	R51147	44,260	44,260	-	-	44,260	-	100%
Total Funding FY14			5,000,000	4,497,663	502,337	65,618	4,563,280	436,720	91%

The Balance of these funds \$436,720 is currently encumbered for equipment – These funds are funds that were recommended by the Aviation industry committee for infrastructure purchases (equipment) to support future research needs. This equipment will be installed at the new Air Capitol Flight Line (ACFL) facility of WSU (the old Boeing military facility). Due to delays in moving from the Beechcraft facility to the old Boeing facility (which occurred due to security and utilities changes required), we did not want this equipment purchased and delivered to the Beechcraft facility and then have to pay to move it to the ACFL facility. Since this equipment is quite sizable and delicate, this would have incurred additional moving expenses by an external rigger company. These funds are being expended currently now that we have completed the move into the ACFL facility