



Oklahoma Center for the Advancement of Science and Technology

2019 Impact Report

OKLAHOMA HEALTH RESEARCH

- The Oklahoma Health Research program funds basic research projects related to human health
- Receive \$10,000 - \$45,000 per year for up to three years

OKLAHOMA APPLIED RESEARCH SUPPORT

- Funds R&D in all fields from medicine, agriculture and energy to manufacturing and aerospace
- Receive \$10,000 - \$45,000 per year for one or two years for proof-of-concept projects
- Receive \$10,000 - \$300,000 over one to three years for accelerated projects

POSTDOCTORAL FELLOWSHIP INITIATIVE

- Encourages recent doctoral degree recipients to better prepare for scientific- and technical-based careers in research institutions or high-tech companies in Oklahoma with the goal of attracting/retaining high quality health research scientists

INTERN PARTNERSHIPS

- Intern Partnerships support R&D projects that involve Oklahoma businesses and institutions of higher education by providing funds to support internship positions
- Receive \$10,000 - \$30,000 per year for up to two years

SMALL BUSINESS RESEARCH ASSISTANCE

- The federal Small Business Innovation Research (SBIR) program has complex application processes that can be challenging for small business owners and entrepreneurs
- The SBRA program improves the success rate of Oklahoma companies applying for the federal programs by providing proposal preparation and submission assistance

PLANT SCIENCE RESEARCH

- Awards funds for basic, proof-of-concept and accelerated research related to plant science for one or two years
- Receive \$10,000 - \$50,000 per year for up to two years

EXECUTIVE DIRECTOR'S LETTER

Fiscal Year 2018 was another amazing year for OCAST in carrying out its mission of growing and diversifying Oklahoma's economy. The state's investment in OCAST continues to pay dividends as the result of investment in cutting-edge research, technology commercialization, entrepreneurial activity and job creation. We are pleased to highlight our accomplishments in this 2019 Impact Report.

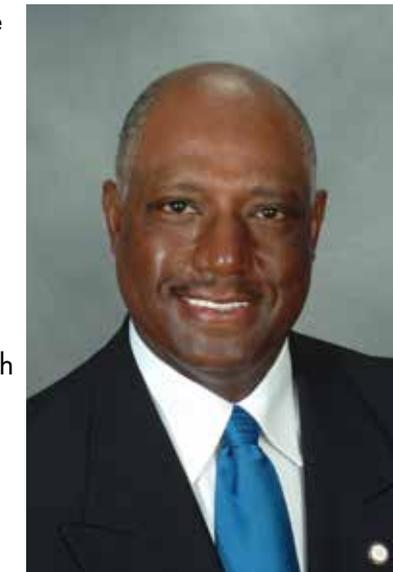
The state's return on investment in OCAST was 34:1 in FY 2018. That means for every dollar the state appropriated to OCAST for science and technology, the state realized a return of \$34 as measured by things such as out-of-state sales revenue, federal grants, private investment and, most importantly, jobs.

When I reflect on the past year and our many successes, I also think about the missed opportunities. Last year 145 research applications were deemed "qualified-for-funding" by outside peer review and rigorous vetting. We were able to fund only 74 of the 145 approved projects. That means 71 approved research projects went unfunded due to budget constraints. Given OCAST's historical return on investment of 22:1, this translates to significant lost opportunity in terms of economic impact, jobs, diversification efforts and the ability to expand research capacity in our state.

OCAST's impact goes beyond the numbers. It's about the people who make up Oklahoma's science and technology community and how our programs have made a difference in their research activities and

accomplishments. We recently interviewed Dr. Wei Chen, professor of biomedical engineering and dean of the College of Mathematics and Science at the University of Central Oklahoma.

Dr. Chen has developed a promising approach to treating metastatic cancer that combines laser irradiation and immunotherapy. OCAST funding supported Dr. Chen's early stage research, which eventually was rewarded a \$1.34 million R01 (health-related) federal grant from the National Institutes of Health.



C. Michael Carolina

"OCAST has been instrumental to my research," Dr. Chen told us. "As early as 2000, when my research had not been recognized widely, OCAST recognized the importance of my idea for this new concept for laser immunotherapy. OCAST funded me in 2000 with an Oklahoma Applied Research Support (OARS) grant. This grant supported my research and allowed me to perform critical experiments to test the concept and lay the foundation for further study. Since 2016, OCAST has been funding me through a Health Research grant. In many ways, OCAST was instrumental to my research and led to my R01 grant."

OCAST's impact on Dr. Chen's work and that of many other Oklahoma researchers and scientists is well chronicled. I look to a future that promises even greater impacts while helping to secure Oklahoma's competitiveness and prosperity in an increasingly global economy.

Patent Applications
74

Patents Granted
72

Value of Patents
\$29,667,000

Jobs Created
1,781

Fiscal Year
2018

Student Interns Hired/Retained
351

Gross Sales Generated
\$597,271,688

Companies Formed
23

Total Payroll
\$256,726,992

Return on Investment

Capital Investments Made
\$268,170,095

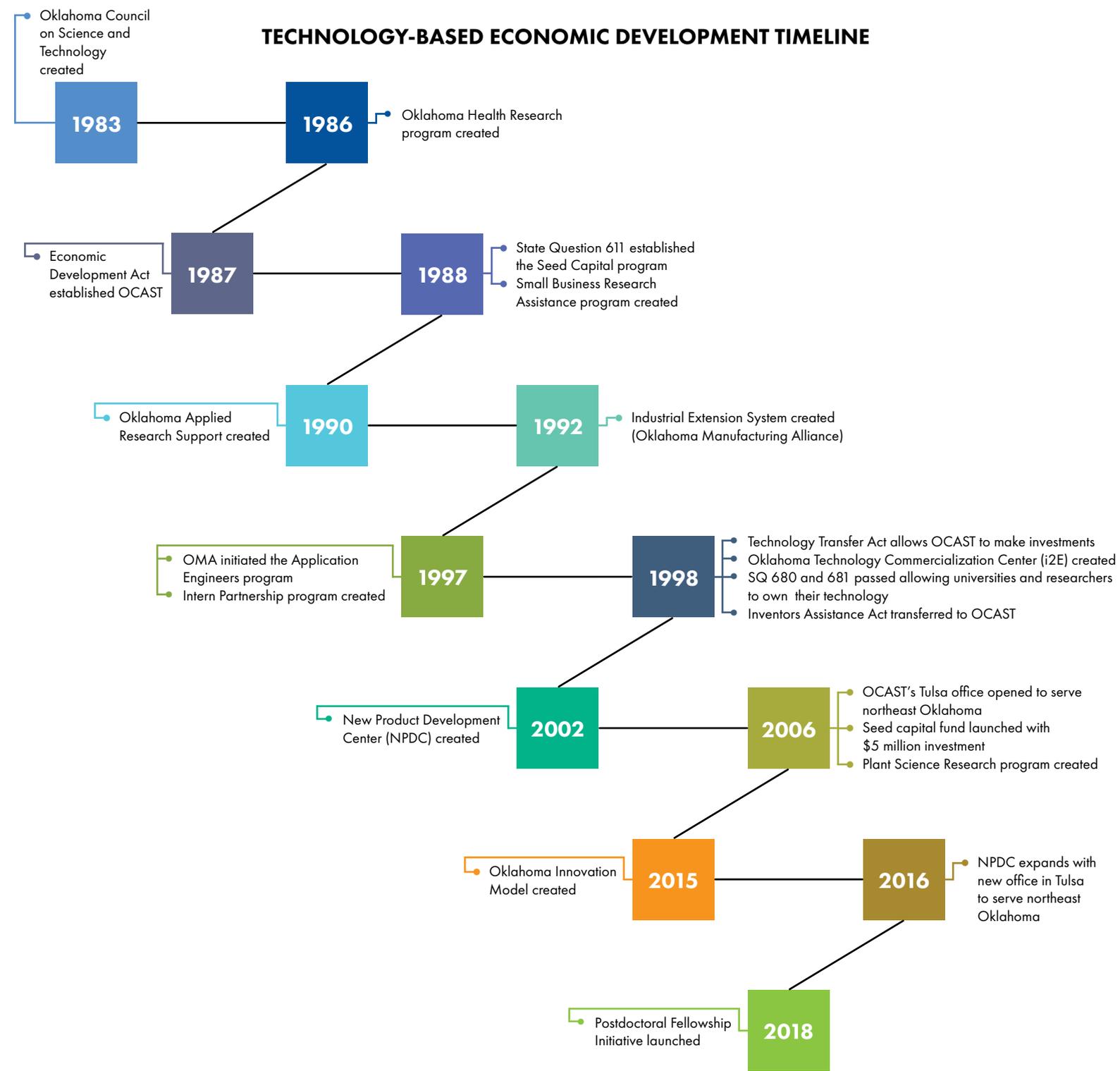
Average Annual Wage
\$44,922

Total Financial Impact
\$1,354,037,662

Follow-on Funds Attracted
\$231,868,897

34:1

TECHNOLOGY-BASED ECONOMIC DEVELOPMENT TIMELINE



OKLAHOMA'S INNOVATION MODEL

A common thread unites Oklahoma's diverse community of scientific researchers, inventors, entrepreneurs and manufacturers. That thread is known as the Oklahoma Innovation Model. The model is synergistic with intersections designed to support ideas, inspire entrepreneurs, develop new enterprises and inevitably create wealth. The model enables the state to supercharge its economy with technology based economic development. We are starting and growing companies and each circle of the model is an essential piece of the economic development process.

OCAST is the hub of the Oklahoma Innovation Model. It is the state's appropriated agency created by the legislature in 1987 to help diversify the economy by facilitating advancements in science and technology. The model has evolved through the years as our nonprofit partners joined us in advancing research, new technologies and business in a true public-private partnership across the state.

Today Oklahoma innovators can access scientific and manufacturing expertise, grant funding and investment to advance their ideas through a network of organizations that include OCAST, the Oklahoma Manufacturing Alliance, i2E Inc., the OSU New Product Development Center and most recently the Oklahoma Catalyst Programs at the OU Tom Love Innovation Hub.

In recent years, Oklahoma has become known as a top state for entrepreneurs. Oklahoma is business friendly and especially attractive to small and medium size companies. The Innovation Model focuses on growing local companies, investing in our own manufacturing and providing a fertile environment for growth and

efficiency. Whether you are an innovator with new ideas or a company expanding into new science and technologies, there is a resource available to you. OCAST and its partners have been able to generate incredible wealth for the state. Each organization highlighted in the model is nationally recognized for its significant contributions to the state of Oklahoma in terms of companies formed, jobs created and return on investment.

OCAST >>

34:1

Return on Investment



**OKLAHOMA
MANUFACTURING
ALLIANCE**

65:1

Return on Investment



53:1

Private Capital Raised

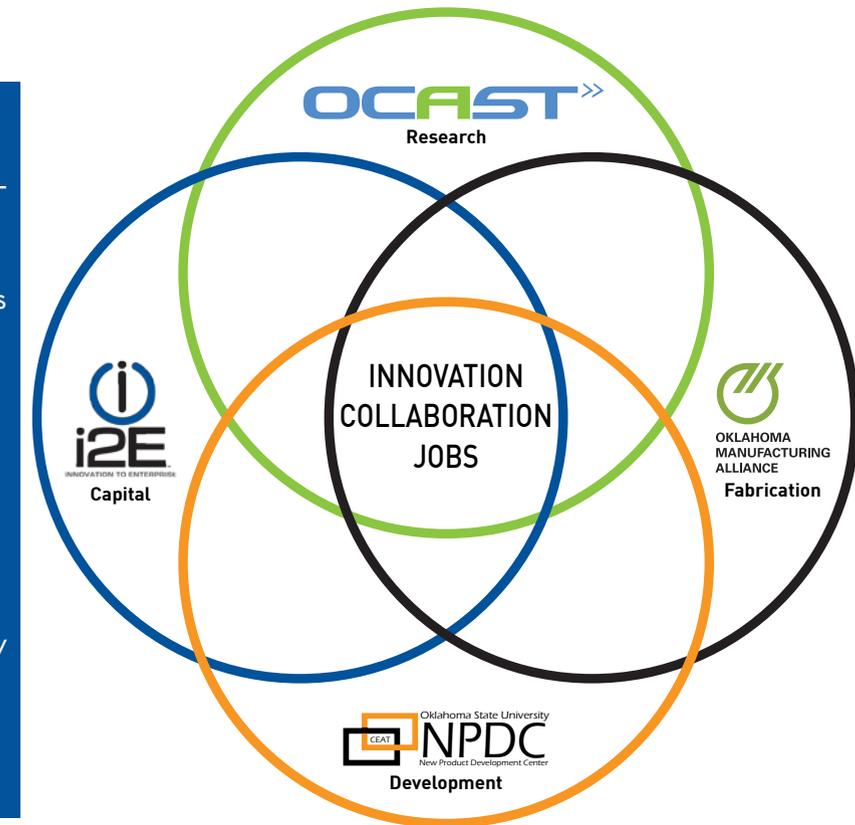
(Technology Business Finance Program)

OKLAHOMA CENTER FOR THE ADVANCEMENT OF SCIENCE AND TECHNOLOGY

www.oast.ok.gov

The Oklahoma Center for the Advancement of Science and Technology is the state's only agency with the sole focus of technology-based economic development.

i2E INC.
www.i2e.org
i2E is a private not-for-profit 501(c)(3) Oklahoma corporation that grows small, innovative, Oklahoma-based businesses to make a positive impact on the entrepreneurial economy within our state. i2E administers the Oklahoma Technology Commercialization Center and the Oklahoma Seed Capital Fund.



NEW PRODUCT DEVELOPMENT CENTER

www.npdc.okstate.edu

Inventors Assistance Service navigates the path from invention to marketplace through education, information and referrals. The NPDC provides design, development, engineering and business support.

OKLAHOMA MFG ALLIANCE

www.okalliance.com

As a 501(c)(3), the OMA connects manufacturers to cost-effective resources, more efficient manufacturing processes and new technologies to increase productivity and reduce costs. Manufacturers must implement new technology and modernize in order to compete successfully in a global economy.



SPIERS NEW TECHNOLOGIES Oklahoma City

- Number of OCAST Awards: 5 (Internships)
- Number of Employees: 75, 8 OCAST Interns
- Number of Patents: 6 Submitted
- Annual Revenue: \$7M

"I am not sure if Spiers New Technologies would have existed without OCAST. As a company, we have gone from 2 to 75 employees and \$7 million in annual revenue in under four years. OCAST had and has a major impact on our business. We are now a world leader in advanced battery life cycle management with clients like GM, Ford, FCA, VW, Audi, Nissan and Eaton. OCAST is one of the reasons we are still here."

- Dirk Spiers

Spiers New Technologies Inc. (SNT) provides repair, remanufacturing, refurbishing and repurposing for advanced battery packs used in hybrid and electric vehicles.

www.spiersnewtechnologies.com

TECHTROL Pawnee

- Number of OCAST Awards: 3 (Applied)
- Number of Employees: 10
- Number of Patents: 2
- Annual Payroll: \$300K



"The assistance from OCAST has allowed us to support about six interns over the years through research projects. Through the grant program, we have had the opportunity to have several prototype products built which would not have been possible without OCAST support."

- Bill Ardrey

TechTrol manufactures electronic controllers, circuit boards and cable assemblies for its own products as well as providing contract manufacturing for clients such as the military, as well as the energy, equipment fabricating, keyboard manufacturing and many more industries.

[Read More](#)

www.techtrol-usa.com

XPLOSAFE Stillwater

- Number of OCAST Awards: 10 (Applied & Internships)
- Number of Employees: 10
- Number of Patents: 4
- Annual Revenues:
 - average annual revenues \$750K – \$1 million
 - developed and commercialized over 15 products
 - leveraged over \$3 million in federal contracts and awards

"OCAST is directly responsible for the origination, growth and the development of XploSafe into a sustainable high technology business in Oklahoma. Almost 10 years since its inception, XploSafe is preparing to build a 6,000 square-foot facility to house its growing operation."

- Shoaib Shaikh



XploSafe delivers critical safety solutions for homeland security and chemical safety, providing products that protect personnel dealing with unstable and hazardous compounds.

[Read More](#)

www.xplosafe.com



OKLAHOMA LIFE SCIENCE FUND Tulsa

- Number of OCAST Awards: 4 (Health & Internships)
- Number of Employees: 388
- Number of Patents: 38 Submitted, 23 Awarded
- Follow On Funding: \$163,456,701
- Impact on Gross Sales: Total sales of OLSF portfolio companies exceeds \$140M

"Each of the interns hired through the OCAST R&D Intern Partnership program have gone on to great careers, including: two Rhodes Scholar finalists, one Marshall Scholar, four graduates of Harvard Business School, one PhD in genetics from Harvard, and several went into entrepreneurial ventures or joined venture capital funds."

- William Paiva

OLSF invests in promising life science technologies where businesses and management teams can be built. Post investment, companies that can successfully develop their core technology and business will result in the formation of stand alone life science companies which are based on Oklahoma technologies.

[Read More](#)

www.olsfventures.com



HOUGH EAR INSTITUTE Oklahoma City

- Number of OCAST Awards: 5 (Applied & Health)
- Number of Patents: 7
- \$5.9M in Leveraged Funding
- \$4M Series A Biotech Startup

"OCAST has been a huge benefit to our company. Because of OCAST, we were able to leverage our work with over \$5M in federal grants advancing one of our products to the clinic and discovering other indications for our pill technology including tinnitus and possibly chronic hearing loss through neural regeneration. A result of another OCAST grant was a DoD award where we were successful as the only funded applicant out of 73 for a \$1.9 M grant and a breakthrough paper on restoring hearing after noise-deafening through cochlear hair cell regeneration."

- Richard Kopke

Hough Ear Institute has pioneered a promising new alternative to restore hearing loss for those living with the condition.

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www.houghhear.org

TRUE DIGITAL SECURITY / TOKENEX Tulsa / Oklahoma City

- Number of OCAST Awards: 10 (Applied, Internships & TBFP)
- Number of Employees: 98
- Number of Interns: 23
- Number of Patents: 6 Filed, 2 Issued
- Annual Revenue: \$17 Million
- Annual Payroll: \$7.2 Million



"OCAST, through its internship and applied research programs, has been critically instrumental in both our employee development, business growth and innovation and technology development efforts."

- Jerald Dawkins

True Digital Security provides security consulting and assessments, compliance readiness, testing and validation and managed IT services for clients across the nation.

[Read More](#)

www.truedigitalsecurity.com

TokenEx provides a technology called 'tokenization' to protect sensitive data such as credit card information and Social Security numbers from hackers.

[Read More](#)

www.tokenex.com

XRG TECHNOLOGIES Tulsa

- Number of OCAST Awards: 1 (Applied)
- Number of Employees: 10
- Number of Patents: 1
- Annual Revenue: \$22M

"The immediate direct impact of the grant was the hiring of two full-time engineers with an expectation of adding another two in the next year. Due to the grant received, XRG has applied for its first patent and secured a reputation in the industry as an up and coming company focused on product development, progress and improvement. This reputation has aided significantly in the immense success that XRG has had since inception."

- Bailey Hendrix



Focusing on fired equipment, XRG delivers advanced engineering and procurement solutions to the power, refining and petrochemical industries.

www.xrgtechnologies.com



INFINITE COMPOSITES TECHNOLOGIES Tulsa

- Number of OCAST Awards: 6 (Applied, Internships & SBIR)
- Number of Employees: 10
- Number of Interns: 3
- Number of Patents: 7 Filed, 3 Issued, Plus 2 International Pending
- Annual Revenue: \$600K

"OCAST has provided numerous funding opportunities for ICT to create and expand our platform technology that can be used for aerospace, defense, industrial gas and transportation applications. The funding received is some of the most valuable investment in the company, incentivizing new and existing hires."

Michael Tate

ICT uses the carbon fiber material to manufacture patented, linerless composite pressure vessels that can store all types of gasses at pressures of 3,000 pounds per square inch or higher.

[Read More](#)

www.infinitecomposites.com



WEATHER DECISION TECHNOLOGIES Norman

- Number of OCAST Awards: 3 (Internships)
- Number of Employees: 81
- Number of Patents: 7
- Annual Revenues: \$13.5 Million

"When we first started the company, we applied for a number of OCAST grants and won a \$300,000 grant in 2001. That helped us start a number of products, helped us license some things from the university and get them run operationally. Two of the employees we hired with that grant are still WDT employees."

- Michael Eilts

Weather Decision Technologies (WDT) offers expertise that applies to hazardous weather detection and prediction, forecast modeling, analytics, mobile applications and interactive mapping.

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www.weatherops.com

FLIGHT SAFETY INTERNATIONAL Tulsa

- Number of OCAST Awards: 3 (Applied & Internships)
- Number of Employees: 640
- Number of Interns: 4 with one permanent hire

"One of the things we are most proud of is the motion system we helped develop. A very smart graduate student at TU worked to obtain an OCAST grant to begin working on changing hydraulic actuators to an electric actuator that was quieter, operated on less power, gave a superior performance, and over time, that development has become the industry standard. A motion system for a flight simulator runs in the hundreds of thousands of dollars, and across the industry, there are perhaps 120 simulators or more delivered a year – all using technology that began with a very small OCAST grant."

- Scott Goodwin



FlightSafety's Broken Arrow campus manufactures full flight simulators that go to commercial and government customers.

[Read More](#)

www.flightsafety.com

APPROPRIATION AND CUMULATIVE RETURN ON INVESTMENT

Activities	FY 2018*	Cumulative ROI
Applied Research	\$2,502,810	46:1
Health Research	\$2,502,809	21:1
Intern Partnership Program	\$403,985	76:1
Plant Science Research	0	19:1
Small Business Research Assistance	\$80,000	41:1
Industrial Extension System**	\$942,862	121:1
Inventors Assistance	\$299,117	6:1
Seed Capital Fund	\$2,933,448	26:1
Technology Commercialization	\$1,493,186	11:1
General Administration	\$718,500	
Program Services and Support	\$1,214,564	
Technology Information Services	\$242,574	
TOTAL FUNDING	\$13,333,855	TOTAL CUME ROI 22:1

General Administration %

5.39%

*The appropriation for FY 2018 was \$13,422,892. However, a general budget reduction of .663% resulted in an adjusted appropriation of \$13,333,855 for FY 2018.

**The Industrial Extension System (Oklahoma Manufacturing Alliance) leverage is based on projections by clients regarding sales and capital investments. Historically, the actual leverage exceeds projections.

"The Inventors Assistance Service and New Product Development Center really helped us get started on this product. They helped us with the mechanical components and what components were going to work and what wasn't going to work. We started with that project and it has spun into several other projects down the road."

Patrick Delehanty

Delco Products, Broken Arrow

[Read More](#)

"An Applied Research grant in 2000 allowed me to perform critical experiments to test the concept and lay the foundation for further study. A 2016 Health Research grant actually gave me the funding needed to fill the gap. Then I had the opportunity to apply for a NIH R01 grant. In many ways, OCAST was instrumental in my research leading to my R01 grant."

Wei Chen

[Read More](#) University of Central Oklahoma, Edmond

FISCAL YEAR 2018 OCAST IMPACTS BY PROGRAM

	Total (all programs)	Health Research	OARS	Intern	Plant
Jobs Created or Retained	1,778	244	248	58	32
Student Interns Hired/Retained	351	180	94	44	34
Total Payroll	\$256,726,992	\$6,96,036	\$10,103,942	\$2,876,267	\$678,268
Average Annual Wage	\$44,922	\$48,577	\$50,4699	\$33,922	\$23,537
Follow-on Funds Attracted	\$231,868,887	\$59,674,330	\$27,179,642	\$2,055,000	\$2,09,916
Patent Applications	74	25	45	5	0
Patents Granted	72	6	16	2	0
Impact on Capital Investments	\$268,170,095	\$18,402,172	\$44,002,275	\$14,582,000	\$59,000
Impact on Gross Sales	\$597,271,688	\$52,140,000	\$74,646,388	\$21,910,500	0
Companies Formed	23	5	15	3	0
Total Financial Impact	\$1,354,037,662	\$136,912,538	\$155,932,247	\$41,423,767	\$2,797,184
Return-on-Investment	34:1	7:1	14:1	23:1	1:1

"The Oklahoma Manufacturing Alliance has been a tremendous help to us over the years through engineering services, through marketing services. We've participated in several programs they offer to help small manufacturers. We are very fortunate to have an organization like the Oklahoma Manufacturing Alliance to help manufacturers in Oklahoma."

Scott Crain

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Texoma Manufacturing, Durant

"We have been very fortunate to have support from OCAST and also from i2E. They have been tremendous support for our development, and provided management support for expanding our market and client base. i2E has supported DRIK not only in finance, but also making sure we can expand our business. That includes analysis of our financials and also suggestions from their advisors."

Kumar Sripathirathan

[Read More](#)

DRIK Safety Testing, Oklahoma City

OKLAHOMA SCIENCE AND TECHNOLOGY RESEARCH AND DEVELOPMENT BOARD OF DIRECTORS

OCAST is a state agency governed by the Oklahoma Science and Technology Research and Development (OSTRaD) Board of Directors (Title 74, Section 5060.6). This 21-member board of directors consists of the director of the Oklahoma Department of Commerce, the chancellor of the Oklahoma State Regents for Higher Education, the secretary of agriculture, the presidents of Oklahoma's three research universities, the president of a regional university, 12 members appointed by the governor and two nonvoting legislators representing the Oklahoma House and Senate. Members appointed by the governor serve with the consent of the senate and generally serve four-year terms.

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Blayne Arthur - Secretary of Agriculture, Oklahoma Department of Agriculture, Food and Forestry

Don Betz - President, University of Central Oklahoma

Gerard P. Clancy - President, University of Tulsa

James L. Gallogly - President, University of Oklahoma

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David Humphrey - Industry Consultant (*Chair*)

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Tammy West - Oklahoma House of Representatives

Sherri Wise - President, Osteopathic Founders Foundation



David Humphrey



Tom Kupiec



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