Commonwealth Research Commercialization Fund

Advancing Technology and Economic Development in Virginia by Investing in Priority Research and Commercialization Activities

ANNUAL REPORT

July 1, 2014 – June 30, 2015

Submitted by the Fund Administrator:
Center for Innovative Technology
on behalf of the Innovation and Entrepreneurship Investment Authority

October 1, 2015

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Executive Summary

In accordance with Code of Virginia Sections 2.2-2233.1 G and 2.2-2221 (18), and on behalf of the Innovation and Entrepreneurship Investment Authority (IEIA), the Center for Innovative Technology (CIT) respectfully submits this report regarding the performance of the Commonwealth Research Commercialization Fund (CRCF) in FY2015. The CRCF accelerates innovation and company formation in the Commonwealth, while solving important state, national, and international problems through technology research, development, and commercialization.

In FY2015, CIT issued one solicitation resulting in $2.8 million invested in 38 projects[1] and leveraging the Commonwealth's investment with approximately $5.6 million in matching funds. These CRCF projects are being performed by companies, universities, and research institutes across the state and align with Virginia's key strategic technology priorities as outlined in the Commonwealth Research and Technology Strategic Roadmap.

$2.3 million was made available to CRCF for FY2015 for the purpose of advancing science- and technology-based R&D and commercialization activities to drive economic growth in Virginia. CRCF's funding capabilities were expanded by an additional $2.4 million as a result of carryover monies and grants that had not been fully expended or had been declined.

Program Impact

CRCF awards seek to solve current and longstanding global challenges in industries such as life sciences, cyber security, advanced manufacturing, and energy. CRCF awards, for instance, hold promise in biosciences for innovative early detection and analysis technologies for pancreatic cancer, prevention technologies and therapeutics for diabetes, and pharmaceutical therapies for brain cancer cell destruction. Cyber security continues to be a critical focus of CRCF projects, from products performing cyber security assessments and identifying malicious intrusions and activity to solutions that secure networks and establish patterns to speed up incident remediation and prevent future attacks. Additional technologies, such as 3D modeling and simulation software for homeland security and high-efficiency solar energy devices, show the reach of Commonwealth innovation. These and other CRCF projects have the potential to have a profound and lasting benefit to citizens of the Commonwealth and to society at large by enhancing quality of life and economic development.

CRCF awards have, primarily, supported technology development at the proof-of-concept stage or earlier, setting the technology on a commercialization path and making it attractive for further investment and/or licensing. Milestones along what can be a multi-year path include clinical trials; FDA approval; investment from federal, private, or other sources; and beta product releases. Already, however, Fund investments have resulted in companies created, expanded, or acquired; products

[1] 38 projects were selected for funding; three organizations declined their awards

launched; revenue generated; intellectual property developed and licensed; key personnel recruited; and other outcomes beneficial to Virginia and beyond. FY2015 reports submitted by award recipients identified early returns on the Commonwealth's investment.

- **Regulatory applications and approvals.** In FY2015, at least nine clinical trials were completed, underway, or recently approved for CRCF-funded technologies. Two award recipients reported their device or drug had received FDA approval. Additionally, at least four awardees are engaged in pre-clinical research and investigational studies.

- **Products/services introduced to market.** At least five new products and/or services were brought to market, two additional products and/or services are anticipated for near-term release, and one platform has been developed for internal use that enables product development and commercialization. CRCF award recipients also reported numerous products in the beta phase. At least 150 licenses for CRCF-funded software have been sold. Nine companies have reported sales revenue, with four of those companies each recording sales over $1 million.

- **Company growth.** At least two new companies, both of which are university spin-outs in life sciences, were formed during FY2015 in the Commonwealth. Several companies have expanded their operations, including through the establishment of satellite facilities. At least 115 new hires were reported by CRCF award recipients; hires range from part-time to full-time and from students to senior-level executives.

- **Additional funding leveraged.** CRCF award recipients reported nearly $60 million in additional investments made in research and technology work after the conclusion of the CRCF projects. Two companies associated with CRCF projects received approximately $15 million combined in supplementary funding, as reported by CRCF awardees.

- **Intellectual property created and licensed.** In FY2015, CRCF recipients reported 28 issued patents, more than 90 patents pending, and more than 30 patents under development, including provisional applications. Two organizations reported having licensed their intellectual property to other entities, and several additional organizations are engaged in active licensing discussions.

- **Publications prepared and accepted.** Articles by CRCF award recipients appear in respected industry journals, and recipients have given numerous presentations domestically and internationally about their novel technology. Fund awardees reported more than 200 total publications and presentations. Of these, publications that have been accepted and published and presentations that have been delivered total more than 160 in FY2015; an additional 25 publications have been submitted and are awaiting publication, and at least 15 publications are in preparation.

Project Samplings

CIT tracks projects during their period of performance and for five years after conclusion, as economic and technological outcomes are typically realized a few years or more after a project is completed. The majority of projects from FY2012, FY2013, and the first round of FY2014 have been completed, while most projects awarded in the second round of FY2014 and in FY2015 are underway. Projects showcasing the Fund's effectiveness in contributing to the economic, technological, and well-being of the Commonwealth follow.

- With the support of an FY2014 CRCF award, Virginia Tech has recruited Dr. Harald Sontheimer to jointly direct a university-wide neuroscience initiative and the new Virginia Tech Carilion Research Institute (VTCRI) Glial Biology in Health, Disease, and Cancer Center, as well as oversee his own laboratory and manage the research of additional new faculty recruits. Dr. Sontheimer is a nationally recognized neuroscientist and expert on the biology of glial cells, the brain's most abundant cell type, and is credited with making foundational discoveries on the functional properties of glial cells in the brain, including the localization and mechanisms of a range of receptors and ion channels that had previously been thought to exist only on nerve cells. His work on the fundamental properties of glial cells led to his discovery of a major new therapeutic approach for the treatment of glioblastoma, the deadliest and most prevalent primary brain tumor in humans. In his role with Virginia Tech's College of Science, Dr. Sontheimer will continue to develop new interventions and therapeutics and investigate the mechanisms underlying glial cell function in healthy, normal brain development, and disease, including brain tumors. Dr. Sontheimer has entrepreneurial as well as research experience; he founded a company which received several patents and led a series of clinical trials before the company was acquired.

- CRCF funding in FY2013 and FY2014 has supported the University of Virginia and Charlottesville-based Neoantigenics, Inc. in their research on SAS1B, a novel cell-surface protein normally expressed only in developing oocytes, but broadly expressed in various human cancers. The team is developing breakthrough monoclonal antibody-based drugs directed at this tumor surface marker as well as diagnostic tests that will guide personalized patient therapy decisions. Outcomes from the projects demonstrate that monoclonal antibody-drug complexes to SAS1B can cause in vitro killing of cancer cells from different types of human tumors. Testing is being conducted on mouse models bearing human tumors to provide proof-of-concept on this disease target. In FY2015, Dr. Eusebio Pires, the eminent researcher recruited to UVa through an FY2014 CRCF award, first-authored a publication in *OncoTarget*, a leading journal that covers novel drug targets. This publication effectively opens the new oncology field of cancer-oocyte neoantigens and introduces SAS1B as a validated immunotherapeutic target. Neoantigenics and UVa combined have leveraged funds totaling more than $5 million to advance this research and development, including an investment by the newly created Pfizer Seed Fund. Neoantigenics was its first recipient. The team continues to strengthen its relationship with Pfizer and engage with additional academic and commercial leaders in the oncology arena to advance its preclinical program.

- A team from the Virginia Institute of Marine Science (VIMS) Aquaculture Genetics and Breeding Technology Center (ABC) is contributing to the continued and advanced growth of oyster aquaculture in the Chesapeake Bay through the development of near-infrared reflectance spectroscopy (NIRS) for use in optimizing genetic characteristics of oysters to enhance the effectiveness of oyster breeding and production of superior brood stock; NIRS enables the rapid determination of critical physiological parameters for oysters that are essential quantitative characteristics for breeding. CRCF funding enabled the team to incorporate NIRS technology for the testing of triploid varieties. Licenses for tetraploid technology advanced through the CRCF-funded project are executed with a dozen hatcheries along the east coast, from Maine to North Carolina, as growers have adopted the use of improved strains to optimize growth rates, disease resistance, and meat quality. As reported in the *Virginia Shellfish Aquaculture Situation and Outlook Report* from March 2015, sales of cultured oysters by Virginia growers made the Commonwealth of Virginia a leader in east coast productivity in 2014; there has been a 20% increase in sales of oysters produced by aquaculture from 2013 to 2014, 90% of which is triploid. While the CRCF project alone is not responsible for this increase, the quality assurance of the triploids is related to the data obtained during this study. Oyster aquaculture contributes to the economy of the Chesapeake Bay with sustainable farming practices and jobs for rural areas, including working waterfronts. Through additional outside funding, including follow-on CRCF funding, the team continues to build on the technology and advance new tetraploid breeding initiatives.

- Cavion LLC, a Charlottesville-based company that delivers first-in-class T-type calcium channel therapies for the treatment of oncologic and neurologic diseases, is the offspring of two Virginia small businesses, Tau Therapeutics, an FY2012 CRCF award recipient, and Xdynia. CRCF funding has assisted Tau, now Cavion, in advancing treatment for glioblastoma, the most common and deadly type of brain cancer, through the development of mibefradil. Mibefradil is a unique, safe, adjunctive therapy that enhances conventional chemotherapies and radiation with the high potential to dramatically improve the standard of cancer care. In the last year, progress towards commercialization has been furthered by multiple activities, including a clinical dose finding and safety trial sponsored in part by the National Cancer Institute Adult Brain Tumor Consortium with promising early results, and a Phase I clinical trial sponsored in part by the Yale Cancer Center to assess the safety and determine the maximum tolerated dose of mibefradil plus radiation in recurrent brain cancer patients. The Yale sponsorship was worth approximately $2 million. As of September 2015, Cavion had closed $5 million of bridge financing and continues to discuss partnerships with large pharmaceutical companies that could include options and/or equity investments; additional discussions have been held with venture capital and biopharma firms. Drug development work continues as the team performs on a $200,000 Virginia Biosciences Health Research Corporation award, researchers pursue use of mibefradil as treatment for other cancers, and through investigation of a potential back-up series of T-type calcium channel inhibitors.

- Charlottesville-based Rivanna Medical has developed the smartphone-sized handheld imaging device, Accuro™, designed to guide a clinician using a needle or probe to a target within the human anatomy. The Accuro™ provides 3D navigation to an anatomical target so a clinician may avoid "guessing" where the target is. The first FDA-cleared application of the device is for spinal anesthesia needle guidance; spinal anesthesia often fails due to reliance on "blind" needle guidance. There are 20+ million neuraxial anesthesia-related (epidural and spinal) procedures per year in the U.S. and 20-80% of all needle placements fail, depending on operator skill and patient age and obesity; the obese and elderly are growing demographics. Enabled by four CRCF awards supplementing federal SBIR Phase I and II project funding and a complementary award to the University of Virginia, the first-of-its-kind Accuro™ device has received FDA clearance, allowing Rivanna to market the device in the U.S.; manufacturing will take place in Charlottesville, and first sales are expected in October 2015. Additionally, in part through CRCF funding, Rivanna is exploring a new opportunity for its automated imaging technology related to the orthopedic market for safe, low-cost guidance of joint injection procedures. Rivanna Medical is garnering considerable attention in social and traditional media, such as the June 20, 2015 front-page story about the company in Thompson Reuters' *Medical Device Daily*™, a major source of news and information for the worldwide medtech industry.

- Manassas-based 3D modeling and data analysis company, ClearEdge3D, Inc., has received two CRCF awards to advance automated modeling software development. The company's core technology, the EdgeWise™ software, creates highly detailed, fully 3D building models of cities and provides officials from the Department of Defense, Department of Homeland Security, municipal governments, and others near-instantaneous access to this accurate and mission-critical data for training, simulation, and operational planning. The latest version automatically extracts gridded structural steel and concrete from LiDAR datasets, dramatically increasing the speed to model the existing as-built condition of facilities. In FY2015, the suite of EdgeWise™ products was repositioned into a single, unified brand; approximately 150 software licenses have been sold this year. ClearEdge reported rapidly growing revenue, posting more than $1.2 million in sales over the last year and giving the company a $2.1 million run rate. ClearEdge continues to raise additional financing rounds and is involved in serious discussions with several important players in the market.

- The Frank Reidy Research Center for Bioelectrics (CBE) at Old Dominion University in Norfolk has spearheaded the new field of bioelectrics, and FY2012 CRCF funding helped the Center develop a novel cancer therapeutic strategy using pulsed power technology, a cornerstone capability of that field. Pulsed power technology was initially developed for military purposes, to store energy and release it instantaneously to produce immediate power. CBE's technology delivers ultrashort bursts – nanosecond pulsed electric fields, or nsPEFs – to treat cancer. nsPEF treatment is efficient at killing tumor cells through a natural cell death process that can reduce or eliminate adverse side effects of traditional cancer treatments and restore immune surveillance, which can potentially limit tissue invasion / metastasis. Further research indicates that tumor ablation using this technology appears to block new tumor growth. New intellectual property has been created and ODU has licensed this

technology. Clinical trials are scheduled to start later in 2015, spearheaded by a company formed around nsPEF technology; the company, which has raised $8 million in private investment, will provide research support to the Center to continue this project.

- HemoSonics, a Charlottesville-based medical device company founded to develop and bring to market innovative instruments to diagnose and guide treatment of pathological clotting and excessive bleeding, is a three-time CRCF award recipient. CRCF FY2012 funding advanced the design, development, and testing of their Quantra platform, which can quickly and accurately quantify specific clotting defects, inform appropriate therapy, avoid unnecessary treatment, and improve patient care. The diagnostic device is designed to provide clinical personnel with data necessary to identify defects of coagulation affecting their patients and guide the appropriate treatment. HemoSonics' outcomes in FY2015 include the initiation of a multi-center study at the University of Virginia and Virginia Commonwealth University to assess the technology's clinical potential and correlation with predicate devices; opening a satellite facility in Durham, NC; filing one patent and being issued one patent from the USPTO; and receiving $2 million in funding from the National Institutes of Health for a Phase IIB project and $1 million from the Air Force for a Phase II project.

- In FY2012, PocketSonics, a Charlottesville-based medical device start-up received CRCF funding to advance its Sonic Window handheld ultrasound device from prototype to commercialization. The device received FDA clearance in 2014 and was successfully launched into the market. CRCF supported experiments that helped PocketSonics make design changes to improve manufacturing yields of a core sub-assembly in the ultrasound device, which assists clinicians in visualizing veins and arteries to guide needle insertion for improved "first attempt success" in placing IVs and catheters in patients. PocketSonics was acquired by Boston-based Analogic Corporation in 2013 to become the basis of a new handheld ultrasound group, providing a lucrative exit for PocketSonics' shareholders, most of whom were Virginia residents. The former PocketSonics team continues to operate from Charlottesville as Analogic's handheld ultrasound engineering group.

  One year after the acquisition, Jeff Pompeo, the former CEO of PocketSonics, left Analogic to launch CareTaker Medical, a new medical device start-up to commercialize a wireless vital signs monitor for remote patient monitoring, continuous beat-by-beat blood pressure measurement, and internal bleeding detection. Since its formation in 2015, the company raised $1 million of seed funding from local investors and has six employees working from its Charlottesville headquarters; plans for raising a Series B round of financing before year-end are underway.

Program Overview

Since the inception of the CRCF program in FY2012, 468 applications were submitted from all of the Commonwealth's ten technology regions and, from these submissions, 184[2] awarded projects were

[2] 184 projects were selected for funding since CRCF's inception; ten awards have been declined

announced. CRCF projects cover the following technology sectors: advanced manufacturing, aerospace, communications, cyber security, energy, environment, information technology – including data analytics, life sciences, modeling and simulation, nuclear physics, and transportation.

Projects funded by CRCF seek to positively impact Virginia's technology future and, per legislative direction, awards made for CRCF projects must support technology sectors identified in the Commonwealth Research and Technology Strategic Roadmap. The Roadmap, a comprehensive planning tool Virginia leaders use to help determine research areas worthy of economic development and institutional focus, identifies technology sectors with the most commercial promise that will drive economic growth throughout the state. The Roadmap is developed through a consultative process that includes the Commonwealth's private sector technology community, academia and other nonprofit research organizations, and economic development professionals.

CIT leverages its programs to facilitate company creation and growth. In relation to other CIT programs, CRCF is part of a pipeline, working closely with the Federal Funding Assistance Program (FFAP), the GAP family of funds, and the cyber security accelerator, MACH37™. CRCF also complements other funding programs in the Commonwealth, such as the Virginia Biosciences Health Research Corporation (VBHRC), a translational human health research accelerator program targeting collaboration between Virginia research universities and industry.

One solicitation was offered in FY2015 and included six programs: Commercialization, Eminent Researcher Recruitment, Facilities Enhancement Loan, Matching Funds, SBIR Matching Funds, and STTR Matching Funds. Applications were invited from academia, research institutions, political subdivisions, and the private sector.

- **Commercialization Program**
  Supported commercialization activities for products in the proof-of-concept phase that had a reasonable probability of enhancing the Commonwealth's national and global competitiveness; eligible firms were established between November 17, 2012 and November 17, 2014.

- **Eminent Researcher Recruitment Program**
  Supported public colleges and universities seeking to acquire or enhance research superiority in qualified technologies through the recruitment of a top scholar to its faculty.

- **Facilities Enhancement Loan Program**
  Enabled public and private universities and political subdivisions to establish and/or upgrade facilities used to commercialize qualified research or technologies, including those developed at the institutions and by Virginia's private sector.

- **Matching Funds Program**
  Enabled public and private colleges, universities, other research institutes, and federal labs in Virginia to leverage federal and private funds designated for the commercialization of qualified research or technologies.

- **SBIR Matching Funds Program**
  Advanced technology commercialization by Virginia-based technology businesses that had won a Phase I and/or Phase II Small Business Innovative Research (SBIR) award. Firms eligible for Phase I matching awards were established on or after November 17, 2011, while firms eligible for Phase II matching awards were established on or after November 17, 2009.

- **STTR Matching Funds Program**
  Advanced technology commercialization by Virginia-based technology businesses that had won a Phase I and/or Phase II Small Business Technology Transfer (STTR) award. Firms eligible for Phase I matching awards were established on or after November 17, 2011, while firms eligible for Phase II matching awards were established on or after November 17, 2009.

CRCF's FY2015 funding was associated with multiple appropriations. The General Assembly appropriated $2.8 million for FY2015. During the fiscal year, $1.5 million was reallocated from CRCF to other economic development programs; this was followed by a $1 million special appropriation made during the 2015 General Assembly session.

Seven technology sectors were eligible for funding in FY2015: advanced manufacturing, specifically robotics, additive manufacturing, and remote monitoring and sensing; communications, specifically next-generation broadband networks, wireless telecommunications, and next-generation 911 infrastructure; cyber security; energy; information technology, specifically data analytics; life sciences; and modeling and simulation.

In FY2015, CIT received 88 applications for five of the six available CRCF programs, totaling $5.9 million; applications were not received for the Facilities Enhancement Loan Program. Applications represented seven of the Commonwealth's ten technology regions and covered all seven strategically important industry sectors. Applications in FY2015 exhibited a strong emphasis on the area of life sciences, though a significant number also focused on advanced manufacturing, energy, and cyber security. Thirty-eight awards were made, and 35 awardees accepted funding; three awards were declined. Awarded projects represented six of the ten regions and six industry sectors: advanced manufacturing, cyber security, energy, information technology, life sciences, and modeling and simulation.

FY2015 CRCF awards, along with awards made since the program's inception, address a breadth of critical research areas. Multiple FY2015 awards have the potential to make significant impact in healthcare, for example, through the development of improved drugs to treat diabetes, HIV, and obesity; wearable technology to improve the patient experience; and new methods of care to repair

eardrum perforations, facilitate corneal transplants, and reduce bacterial infections resulting from medical implants. Cyber security remains a CRCF target; FY2015 technologies included those employing proprietary algorithms to detect intrusion and/or the source of malware. CRCF also funded technologies which may result in smaller, more energy efficient batteries, even technologies designed to harvest energy from their environment.

CRCF awards were selected by the CIT Board of Directors following a multi-step review process that included funding recommendations made by the Research and Technology Investment Advisory Committee (RTIAC). The RTIAC is a legislatively-established body that, in FY2015, was comprised of representatives drawn from higher education, economic development, research institutes, venture capital firms, and technology corporations. The list of FY2015 RTIAC members is included as Appendix B.

A brief overview of each project announced for award in FY2015 is provided in Appendix A.

FY2015 Program Administration

Administrative activities in FY2015 included overseeing the solicitation and RTIAC, outreach, and award management for projects funded in FY2012 through FY2014. CIT received $270,185 for Fund management.

As Fund Administrator and with the support of the RTIAC, CIT developed the approach for the FY2015 solicitation, including program guidelines, review processes, and use of an online grants management system, CyberGrants, to facilitate application submissions and reporting. Following the review of more than 130 Letters of Intent (LOIs) and subsequent proposal submissions, CIT led a multi-step proposal review process. CIT performed an internal compliance review to determine which applications advanced to examination by subject matter experts. These subject matter experts, including individuals from industry, academia, government, and the venture capital community, evaluated and rated proposals. Those that advanced were reviewed by the RTIAC. The RTIAC assessed projects and recommended to the CIT Board of Directors those which should be funded. The CIT Board made final selection decisions, after which awards were announced.

CIT maintained information on the Fund, including solicitations and awards, on its website. Press releases announced the request for proposals and, subsequently, award recipients. Outreach and communications also included email announcements and speaking engagements. Outreach efforts were supplemented by the additional communication networks of Virginia's regional technology councils; individual colleges and universities, research organizations, and federal labs; the Virginia Biotechnology Association (VABIO); the State Council of Higher Education for Virginia (SCHEV); the Virginia Economic Development Partnership (VEDP); and the Administration.

Also as Fund Administrator, CIT managed awards and produced the FY2014 Annual Report. This included assessing project performance on an ongoing basis. Additionally, CIT provided support to external

organizations, state agencies, and researchers from academia, industry, and other members of the technology community that desired information about the Fund and future solicitations. Lastly, throughout the year, CIT provided oversight to ensure compliance with the CRCF guidelines and other requirements.

Preparations for FY2016

The General Assembly and Administration appropriated $3.8 million to CRCF for FY2016 and planning began early in the fiscal year.

The Fund Administrator will continue to monitor projects and will report on them for five years after their period of performance ends in order to capture commercialization results and economic outcomes, including job and company creation, and new revenues.

APPENDIX A: FY2015 Award Details

Award Recipient	Project Title	Project Description	Period of Performance	Principal Investigator	CRCF Award	Match
COMMERCIALIZATION PROGRAM						
AxonAI, Inc.	*Echosight Modeling and Prediction Software*	The Echosight software toolkit allows users to model, simulate, and predict behavior of complex systems and the entities that comprise them. CRCF funding will be used to conduct pilot projects to help commercialize this software.	6/16/2015 – 4/01/2016	Sven Brueckner	$50,000	$50,000
AxonAI, Inc.	*Internet-of-Things Security*	AxonAI has developed a swarm intelligence methodology, which, combined with advanced peer-to-peer technology, can protect the Internet-of-Things (IoT).CRCF funding will allow AxonAI to create a prototype IoT security product.	6/16/2015-4/01/2016	Michael Markulec	$50,000	$50,000
CyberRock Inc.	*CyberTrack: Automated Attack Attribution across Large-Scale Networks in Real-Time*	CyberRock seeks to build a prototype product which, in collaboration with intrusion detection and prevention systems, has the capability to automatically identify hidden attack paths and track detected attacks to their sources.	6/16/2015-6/15/2016	Xinyuan Wang	$50,000	$50,451
DialySensors LLC	*Dialysensing™: Improving the Efficacy and Patient Outcomes of Hemodialysis and Peritoneal Dialysis through the Use of Raman Spectroscopy and Multivariate Statistical Analysis*	This project seeks to commercialize a new technology for assessing, in near/real-time, dialysis efficacy by measuring patient metabolic molecule signatures in dialysate waste to allow individualized therapy to improve the outcomes of hemodialysis and peritoneal dialysis.	6/16/2015-6/15/2016	John Robertson	$50,000	$58,000
eTrans2020, Inc	*Connected Vehicle Validation and Security*	eTrans will build a proof-of-concept system to test connected vehicle systems for cyber security vulnerabilities.	6/16/2015-12/16/2015	Manual Villar	$50,000	$126,150

Award Recipient	Project Title	Project Description	Period of Performance	Principal Investigator	CRCF Award	Match
Ischemalert, LLC	*Point-of-Care Device for Detection of Acute Cardiac Ischemia*	Ischemalert is developing a proof-of-concept portable point-of-care device to enable near real-time detection of acute cardiac ischemia, allowing for earlier treatment to limit or prevent myocardial infarction.	6/30/2015-12/30/2015	Gerard Eldering	$49,776	$49,816
Key Cybersecurity, Inc.	*CyberMerlin – Illicit File Activity Detection Solution*	Key Cybersecurity's product proactively identifies illicit file activity and associated "bad actor" activity – modified files or patterns and heuristics of malicious activity. CRCF funding enables the company to apply their technology to additional types of files.	6/16/2015-6/16/2016	Shawn Key	$50,000	$50,000
RioGin	*In Vivo Validation of PYY Antiobesity Drug with Weekly Administration*	This project seeks to validate that RioGin's PYY compounds have desirable properties for a weekly anti-obesity drug through in vivo studies.	7/01/2015-6/30/2016	Cyrille Gineste	$50,000	$50,000
RioGin	*Long-Lasting HIV Entry Inhibitors*	This project seeks to create a modified version of Fuzeon, an entry inhibitor drug for HIV, which is costly to prescribe due to 2x daily injections.	7/01/2015-12/31/2016	Cyrille Gineste	$50,000	$50,000
Syncurity Corporation	*Syncurity Forensic Artifact Collection*	This CRCF project will allow Syncurity to add functionality to its existing incident response management platform to automate live-host forensic artifact collection, to better provide analysts with details needed to remotely determine a course of action.	6/16/2015-10/31/2015	Jean Bourget	$50,000	$61,000
Tympanogen	*A Novel Gel patch for Nonsurgical Treatment of Eardrum Perforations*	Tympanogen has developed a light-curable gel patch to repair eardrum perforations with a nonsurgical procedure. This project supports research and development necessary for obtaining FDA approval.	6/16/2015-2/29/2016	Elaine Horn-Ranney	$49,489	$206,692
TOTAL COMMERCIALIZATION PROGRAM AWARDS:					**$549,265**	
TOTAL COMMERCIALIZATION PROGRAM MATCHING FUNDS:					**$802,109**	

Award Recipient	Project Title	Project Description	Period of Performance	Principal Investigator	CRCF Award	Match
EMINENT RESEARCHER RECRUITMENT PROGRAM						
Eastern Virginia Medical School	*Recruitment of Eminent Investigator in HealthCare Science and Discovery Research*	EVMS seeks to recruit a nationally recognized health services and analytics researcher to lead research using Big Data from electronic medical records and public health databases. The researcher will be located in a new Center for Health Analytics and Discover at EVMS, comprised of a team of biostatisticians and epidemiologists.	7/1/2015 – 6/30/2017	Jerry Nadler	$250,000	$250,000
TOTAL EMINENT RESEARCHER RECRUITMENT PROGRAM AWARDS:					**$250,000**	
TOTAL EMINENT RESEARCHER RECRUITMENT PROGRAM MATCHING FUNDS:					**$250,000**	
MATCHING FUNDS PROGRAM						
College of William and Mary	*Reducing Smartphone Application Delay through Read/Write Isolation*	This W&M team is designing and implementing a system prototype to reduce application delay. CRCF funding will allow the team to incorporate the solution to mobile devices.	6/16/2015-6/15/2016	Gang Zhou	$99,998	$99,998
Commonwealth Center for Advanced Logistics Systems	*Aviation Drop-In Biofuels: Sustainable Supply Chain in Virginia in Support of Farm-to-Fly 2.0 and State Agricultural/Economic Objectives*	The objective of this project is to analyze various aviation biofuel pathways to determine commercial viability within the Commonwealth and to implement a Farm-to-Fly 2.0 program in Virginia.	6/16/2015 – 6/15/2016	James Lambert	$99,988	$100,001
Commonwealth Center for Advanced Manufacturing	*High Speed Telemetry for Machining*	Researchers at CCAM are seeking to solve the problem of unpredictable tool wear through the development of intelligent tools that connect machine tools to the machine controllers to provide quantified information on what happens to a tool or insert during the cutting process.	7/1/2015 – 7/1/2016	Benjamin Zimmerman	$100,000	$261,968
Eastern Virginia Eye Institute	*Corneal Endothelial Allograft Transport and Transplant Device*	EVEI has developed an instrument that can be used to transport the corneal allograft from the laboratory to the operating room, facilitates accurate placement of the grafts	6/16/2015-6/16/2016	Sandeep Samudre	$100,000	$129,500

Award Recipient	Project Title	Project Description	Period of Performance	Principal Investigator	CRCF Award	Match
		to improve surgical outcomes, and allows for allograft storage. This funding will allow EVEI to design and fabricate a prototype instrument, perform in vitro testing, and apply for FDA approval.				
Old Dominion University Research Foundation*	*Real-Time Fusion of Medical Images for Personalized Image Guided Diagnosis and Theory*	This funding will be used for translational R&D of existing software used for medical image fusion to be used in image-guided neurosurgery and emerging medical simulators.	6/16/2015-6/15/2016	Nicolaos Chrisochoides	$100,000	$100,000
Old Dominion University Research Foundation	*Development of Hybrid Boron Nitride/Carbon Nanotubes Supercapacitors for High-Density Energy Storage*	This team seeks to develop hybrid boron nitride/carbon nanotube supercapacitors for energy storage as a response to the increasing demand for efficient, robust, and compact energy storage devices.	7/01/2015-6/30/2016	Gon Namkoong	$100,000	$100,000
The George Washington University	*A Wireless Wearable Electrocardiogram Sensor on Ring Finger*	GWU researchers are developing a finger-ring-shaped wearable ECG sensor, which can be activated on-demand and wirelessly send multi-lead signals to a smartphone or a remote-authorized physician.	7/01/2015-6/30/2016	Zhenyu Li	$100,000	$100,000
University of Virginia	*Insulin-ORAL Renewal Application*	This group aims to develop a room temperature stable, oral insulin product to increase the convenience and safety of administering peptide and protein therapeutics.	7/1/2015 – 6/30/2016	Mark Kester	$100,000	$100,000
University of Virginia	*Accelerating Data Analytics (Bioinformatics) Applications using the Automata Processor*	UVa researchers seek to accelerate several key bioinformatics applications by using the Micron Automata Processor and develop marketable accelerator software and hardware solutions.	7/1/2015 – 6/30/2016	Mircea Stan	$100,000	$100,000
Virginia Commonwealth University	*Rehab Fingerprint – A Patient Centered System to Measure the Impact of Physical Rehabilitation*	This VCU team has developed a wearable device for physical therapy patients that transmits performance data wirelessly to a central database, allowing for improved patient care and more efficient use of	7/1/2015 – 6/30/2016	Peter Pidcoe	$29,263	$44,626

Award Recipient	Project Title	Project Description	Period of Performance	Principal Investigator	CRCF Award	Match
		therapists. CRCF funding supports refinement of the algorithm and additional testing and validation of the system.				
Virginia Commonwealth University	*Rapid Measurement of Plasma Antithrombin*	CRCF funding supports R&D and development of a prototype point-of-care device that allows clinicians to quickly and accurately measure plasma antithrombin levels to ensure that patients receive the correct clinically effective dose of the drug.	7/1/2015 – 6/30/2016	Umesh Desai	$100,000	$100,078
Virginia Commonwealth University	*A Modeling and Simulation Hub for Straintronic Logic and Memory Technology*	VCU researchers seek to build a M&S hub for design and analysis of straintronic logic and memory systems for ultralow-energy next- generation computing and signal processing. This funding will allow the team to develop simulators and to test the predictions of the simulations.	6/16/2015 – 6/15/2016	Supriyo Bandyopadhyay	$100,000	$100,000
Virginia Commonwealth University	*Nano-Inspired Electrolytes and Cathode materials for a New Generation of Li and Na-Ion Batteries*	This project will advance the development of a new generation of lithium and sodium ion batteries that are more safe, efficient, and durable than those currently used.	7/1/2015 – 6/30/2016	Puru Jena	$100,000	$100,000
Virginia Institute of Marine Science, College of William & Mary	*Eliminating Plastic Shotgun Wads as a Source of Harmful Aquatic Debris*	VIMS researchers aim to develop a cost-effective, high-performance solution to eliminating shotgun wads as harmful aquatic debris.	7/01/2015-6/30/2016	Kirk Havens	$83,971	$83,973
Virginia Tech	*Novel Coatings to Prevent Bacterial Colonization of Medical Implants*	This VT team is proposing a new technology to delay the chain of events in an infection arising from a medical implant using thin films of colloidal crystals.	7/01/2015-6/30/2016	William Ducker	$99,704	$99,705
Virginia Tech	*Energy-Harvesting Vehicle Suspensions*	VT researchers are creating a retrofittable, efficient, reliable regenerative shock absorber to intelligently utilize the harvested energy for vibration control of the vehicle.	7/01/2015-12/31/2016	Lei Zuo	$100,000	$100,000
TOTAL MATCHING FUNDS PROGRAM AWARDS:					**$1,512,924**	
TOTAL MATCHING FUNDS PROGRAM MATCHING FUNDS:					**$1,719,849**	

Award Recipient	Project Title	Project Description	Period of Performance	Principal Investigator	CRCF Award	Match
SBIR MATCHING FUNDS PROGRAM						
BlueTherm Corporation*	*Thermal Management for Energy Efficient Computing*	This technology enables high-end computer chips and electronics to operate cooler, faster, and with more energy efficiency; it also has the potential to allow for energy recovery.	06/16/2015-12/15/2015	Carl Bailey	$50,000	$150,000**
Cell Free Bioinnovations Inc.	*Developing a Sugar Biobattery Prototype with High-Power and High-Energy-Density*	CFB will develop a sugar biobattery prototype with high-power and high-energy-density that will be similar in size to a current Li-ion based power bank, but with more than 10 fold energy storage density.	7/01/2015-12/31/2015	Zhiguang Zhu	$50,000	$677,746**
D-Tech, LLC	*A Dynamic and Scalable Identity Federator for Enhanced and Cloud Security*	D-Tech is developing an innovative solution to streamline and automate the identity and access management system configuration process by enabling cloud consumers to provision and set up their own IAM services with the same ease and convenience of setting up virtual machines.	6/22/2015-12/22/2015	Nick Duan	$50,000	$728,705**
Ghodousi, LLC	*Assistive Digital Vision for the Blind*	Ghodousi is manufacturing a device that can provide remote sensing for the blind and low-vision population by integrating sonar and a camera in a device that can be worn like glasses.	7/01/2015 – 12/31/2015	Arman Ghodousi	$50,000	$172,500**
PaneraTech, Inc	*IMECSFab for Inline Inspection of Touch Sensors*	PaneraTech is developing a sensor for non-contact evaluation of nanofiber and specialty touch films to provide the capability to rapidly assess the electrical and physical properties of these films during the manufacturing process.	8/01/2015-4/30/2016	Yakup Bayram	$49,963	$299,972**
SoundPipe LLC*	*Co-injection Drug Delivery with Contrast-Enhanced Intravascular Ultrasound*	SoundPipe is developing an ultrasound imaging and therapy catheter system for ultrasound and microbubble enhanced drug delivery to prevent neointimal hyperplasia following angioplasty.	8/16/2015-11/16/2015	Joseph Kilroy	$50,000	$50,000***

SoundPipe LLC	*Patient Tailored 3D Drug Delivery with Intravascular Ultrasound*	This funding enables SoundPipe to develop tools to provide patient-tailored 3D drug delivery, using their ultrasound imaging and therapy catheter system.	8/16/2015-11/16/2015	Joseph Kilroy	$50,000	$50,000***
StemCellLife LLC	*Highly Bioactive, Synthetic Peptides Coated Cultureware for the Culture of Human Pluripotent Stem Cells*	This project aims to develop low-cost and xeno-free, highly active pure synthetic coatings that are applicable to regular cell culturewares. These sequences will support the survival, adhesion, growth, and long-term culture of human induced pluripotent stem cells.	8/01/2015-7/31/2016	Xiaoyan Liu	$50,000	$224,879**
				TOTAL SBIR MATCHING FUNDS PROGRAM AWARDS:	**$399,963**	
				TOTAL SBIR MATCHING FUNDS PROGRAM MATCHING FUNDS:	**$2,353,802**	
STTR MATCHING FUNDS PROGRAM						
Cambrian Design and Development LLC	*Objective Tremor Detection System for Continuous Monitoring, Assessment, and Treatment Planning for Neonatal Abstinence Syndrome*	CRCF funds support customer discovery efforts, business model validation, and relationship-building with strategic partners – steps critical to commercialization. Cambrian's technology objectively captures indicators of Neonatal Abstinence Syndrome to enable more accurate, safer, and patient-centric treatment plans.	8/01/2015-6/30/2016	Michael Abbott	$49,992	$224,944**
VoltMed Inc.	*Minimally Invasive Surgical Platform for H-FIRE and Chemotherapy Treatment*	VoltMed seeks to develop an impedance monitoring probe that can monitor drug intake during pancreatic cancer treatments combining high-frequency irreversible electroporation (H-FIRE) and chemotherapeutic agents.	7/1/2015 – 12/31/2015	Paulo Garcia	$50,000	$225,000**
				TOTAL STTR MATCHING FUNDS PROGRAM AWARDS:	**$99,992**	
				TOTAL STTR MATCHING FUNDS PROGRAM MATCHING FUNDS:	**$449,944**	
				TOTAL CRCF FY2015 AWARDS:	**$2,812,144**	
				TOTAL CRCF FY2015 MATCHING FUNDS:	**$5,575,704**	

FY2015 Funding Totals

PROGRAM	FY2015 AWARD TOTAL	FY2015 MATCHING FUNDS TOTAL
Commercialization Program	$549,265	$802,109
Eminent Researcher Recruitment Program	$250,000	$250,000
Matching Funds Program	$1,512,924	$1,719,849
SBIR Matching Funds Program	$399,963	$2,353,802
STTR Matching Funds Program	$99,992	$449,944
ALL PROGRAMS	**$2,812,144**	**$5,575,704**

* Indicates declined award

** Matching funds provided toward the CRCF project are the federal SBIR / STTR awards

*** Federal SBIR award amount not known, but totals at least $50,000, the amount of the CRCF award

APPENDIX B: RTIAC Members

The following individuals were members of the Research and Technology Investment Advisory Committee (RTIAC), the group responsible for making award recommendations to the CIT Board of Directors, in FY2015.

- **Martin Briley**, President and CEO, Virginia Economic Development Partnership (VEDP)
- **Vikas Chandhoke,** Vice President for Research and Economic Development, George Mason University[3]
- **Claudio Cioffi**, Interim Vice President for Research and Economic Development, George Mason University[3]
- **Morris Foster**, Vice President for Research, Old Dominion University[4]
- **Dan Gonzalez**, Principal, Avison Young
- **Rodger Harvey**, Interim Vice President for Research, Old Dominion University[4]
- **Bob Kahn**, Chairman, CEO & President, Corporation for National Research Initiatives (CNRI)
- **Dennis Manos**, Vice Provost for Research and Graduate/Professional Studies, College of William and Mary
- **Ken Newbold**, Associate Vice Provost for Research and Scholarship, James Madison University
- **Rob Patzig**, Senior Managing Director and CIO, Third Security
- **Finis Southworth**, Chief Technology Officer, AREVA

[3] Cioffi replaced Chandhoke by virtue of position in December 2014
[4] Foster replaced Harvey by virtue of position in August 2014