Commonwealth Research Commercialization Fund

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

ANNUAL REPORT

July 1, 2016 – June 30, 2017

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

October 2, 2017

Table of Contents

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 FY2017. The CRCF accelerates innovation and drives economic development in the Commonwealth, while solving important state, national, and international problems through technology research, development, and commercialization.

Economic outcomes reported in FY2017 by CRCF award recipients identified early returns on the Commonwealth's investment and include nearly $100 million in follow-on monies to support further technology advancement, more than $5 million in in-kind contributions, two new companies formed, and more than 25 products or services launched. In support of the Fund's goal to commercialize high-potential technology, annual outcomes reported by awardees often reflect the maturation and evolution of an organization and its technology as they journey down the path toward market entry. Outcomes, as well as several project profiles, are discussed below.

In FY2017, CIT offered one solicitation, which resulted in 40 awards[1] totaling $2.7 million and leveraging the Commonwealth's investment with approximately $7 million in matching funds. These CRCF projects are being performed by companies, universities, and research organizations across the state and align with Virginia's key strategic technology priorities as outlined in the Commonwealth Research and Technology Strategic Roadmap.

The program was supported by a $2.8 million FY2017 General Fund appropriation. Funds available for awards and CIT's administrative fee reflected a $200,018 reduction from the state's required savings strategy. The reduction was offset in part by carryover monies from 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, energy, and unmanned systems. CRCF awards, for instance, hold promise in biosciences for innovative early detection and analysis technologies for brain, breast, and pancreatic cancers; prevention technologies and therapeutics for diabetes; and wearable sensors that monitor various health concerns. 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, energy harvesting devices, and autonomous vehicle sensing and detection show the reach of

[1] 40 projects were selected for funding; one organization declined their award

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 launched; revenue generated; intellectual property developed and licensed; key personnel recruited; and other outcomes beneficial to Virginia and beyond. FY2017 reports submitted by award recipients identified early returns on the Commonwealth's investment, and aggregate figures are outlined below.

- **Additional funding leveraged.** CRCF award recipients reported attracting nearly $100 million in follow-on monies to support research and technology efforts after CRCF projects concluded. Sources of funding ranged from angel and venture capital to corporate partners to grant funding. An additional $5 million was leveraged from in-kind support and more than $33 million has been reported as pending.

- **Organizational growth and expansion.** In FY2017, at least two new companies were formed to commercialize or otherwise extend the reach of CRCF-developed technologies, two companies were acquired, at least two organizations expanded or established facilities, and at least one company established operations in the Commonwealth. More than 150 jobs have been created, including full-time and part-time and with hires ranging from students supporting a specific project to senior-level executives to consultants. More than 90 jobs with a similar spectrum have been retained. CRCF awardees reported more than $7 million in sales revenue over the past year, with three organizations each reporting figures of more than $1 million.

- **Products / services introduced to market.** More than 25 new products and/or services have been introduced to market, as reported by CRCF awardees in FY2017, and two organizations anticipate near-term releases. An additional 20 technologies were reported as under development, including at the beta, demo, or prototype stage. More than 330 licenses for CRCF-funded software have been sold.

- **Intellectual property created and licensed.** CRCF award recipients reported 19 patents granted, 41 patents filed or pending, and 12 patents applications under development; this includes USPTO, non-U.S., and provisional patents. Additionally, 13 invention disclosures have been reported, along with several trade secrets and copyrights. Several organizations are actively pursuing licensing agreements for their technology.

- **Regulatory applications and approvals.** Fund recipients reported that more than 20 clinical trials or studies were completed, underway, or recently approved. Additionally, at least three awardees are engaged in or on the path to pre-clinical research and investigational studies.

Each year CIT assesses and refines CRCF reportable criteria to best reflect the types of economic outcomes being demonstrated in the Commonwealth. For example, in FY2015, CIT began tracking academic IP, follow-on investment, and jobs. In FY2017, reports indicate numerous awardees engaged in creating and licensing IP. Additionally, since FY2015, awardees have reported more than $300 million in cash and in-kind support and more than 750 jobs created and retained.

Project Samplings

CIT tracks projects during their period of performance and for five additional years, as economic and technological outcomes are typically realized a few years or more after a project is completed. The majority of projects from FY2012-FY2016 have ended; projects awarded in FY2017 are just recently underway. Projects showcasing the Fund's effectiveness in contributing to the economic, technological, and well-being of the Commonwealth follow.

- Bioscience-focused companies in Charlottesville demonstrated significant ROI in FY2017, continuing the trend historically exhibited by this industry and region of the Commonwealth. HemoSonics, LLC, a three-time FY2012 award recipient to advance their hemostasis technology announced this year its acquisition by the Stago Group of France, a leading player in the in-vitro diagnostic industry. Additionally, they secured $15 million in private investment and received notification of a $500,000 award from the Department of Defense (DoD). They continued to expand their Durham, North Carolina facility, while maintaining their headquarters in Charlottesville as they prepare for commercialization on a global basis. Contraline, Inc., is a medical device company developing a long-lasting, non-hormonal, reversible male contraceptive. The young company has created six new jobs in FY2017, recruiting scientists from around the nation to the Commonwealth, and recently expanded their Charlottesville facility to 4,600 sq. ft. The FY2016 and FY2017 award recipient completed a $2.25 million seed round, laying the groundwork for a $5-10 million Series A round next year to fund preclinical studies and manufacturing. Four-time award recipient in FY2013, FY2014, and FY2016, Rivanna Medical, began distributing their automated 3D epidural guidance product, the Accuro®, in the UK, received Health Canada approval, and secured both U.S. and international patents for the technology. In addition, the team has secured $3.5 million in follow-on investment and $3 million in federal funding this past year. HemoShear Therapeutics, which received FY2012 and FY2013 funding to develop and validate their baseline human vascular and liver surrogate biological systems for new drug discovery, signed an agreement in late September 2017 with a major pharma company to discover drugs to treat fatty liver diseases. Under the agreement, HemoShear is eligible to receive up to $500 million in research and milestone payments. The deal will be announced publicly in mid-October. Furthermore, the company is discussing potential investment with two publicly traded pharma companies. HemoShear was named the

winner of the President's Award from the American Association for the Study of Liver Diseases for their work on the human surrogate liver system as well as Governor McAuliffe's 2017 Science Innovation Award.

- In FY2015, CRCF invested in Dr. Kirk Havens and colleagues' work at the Virginia Institute of Marine Science (VIMS) to produce and field test a biodegradable shotgun wad. In addition to refining a preliminary product and strengthening the IP position, during the course of the project, GreenOps Ammo Inc. was spun out to commercialize high-performance, non-polluting shotgun ammunition. In FY2017, CRCF awarded funds to the Williamsburg-based company to refine the product and produce shells for prototype testing by users and potential distribution partners, making the technology ready for manufacturing scale-up. Conventional plastic shotgun wads, while a critical component of shotgun ammunition, also are a significant source of plastic litter, particularly in aquatic environments. To date there are no biodegradable wads that can perform as effectively as these conventional wads. GreenOps Ammo, based on the work conducted by VIMS, expects to commercialize such a product in 2018, and may be in a position to revolutionize a market that faces increasing environmental and hunting regulations.

- Virgil Security, an FY2016 awardee and fall 2014 MACH37™ cohort company, is changing the way people protect their data and devices through the use of robust, scalable, and flexible integrations that allow a novice or expert developer to implement security on desktop, embedded, mobile, and cloud- or web-based applications. With support from CRCF funding, the Manassas-based company shifted its cloud-based technology from a centralized trust model to a new distributed trust model, reducing key lookups from as much as 400+ milliseconds to as little as three milliseconds – more than 100x faster. In the past year, Virgil closed a $4 million Series A investment round, established partnerships with leading organizations around the world who are deploying Virgil's platform, and introduced Key Management as a Service to market. The CRCF project enabled revenue generation from the technology, which is forecast for 2017 in the $2.5-4 million range.

- In FY2014, CRCF awarded funds to Dr. Sarah Sojka, Assistant Professor of Physics and Environmental Studies at Randolph College, to support a collaborative project with Salem, Virginia-based company Rainwater Management Solutions, Inc. (RMS). The goal of the project was to collect baseline data on the ability of RMS' modular rainwater harvesting system to provide water suitable for residential non-potable uses and examine the impact of specific system components on water quality. In the nearly two years since project conclusion, RMS has not only brought their system to market, but also has generated revenue from the industry-leading technology. Moreover, RMS has established a distribution agreement with the largest national wholesale distributor of landscape supplies in the U.S., providing a platform for distribution of the RMS rainwater harvesting options. The advancement of RMS' technology and the data generated from Randolph College has attracted additional investment.

- Ceres Nanosciences, Inc. delivers innovative products that address critical diagnostic needs and provide better patient outcomes. In FY2016, the Manassas-based company was profiled after demonstrating successful outcomes of their FY2013-funded work to improve a platform technology to collect, transport, and store biological samples. Over the past year, Ceres continues to demonstrate commercial success. To date, the team has closed $7.5 million of a $9 million Series A round, with additional industry investment toward product development; by the end of CY2017, Ceres expects to complete the fundraise. The company continues to secure and perform on federal and other grant projects, including new Bill and Melinda Gates Foundation funding and awards through the Department of Defense (DoD), Defense Threat Reduction Agency (DTRA), and Defense Advanced Research Projects Agency (DARPA). Ceres also exhibits continued achievement through job creation and retention, revenue generation, and new patents.

Program Overview

Since the inception of the CRCF program in FY2012, 782 applications were submitted from all of the Commonwealth's ten technology regions and nine GO Virginia regions and, from these submissions, 272[2] awarded projects were announced. These announced awards total more than $22 million and are being leveraged with nearly $60 million in committed matching funds, including federal awards. CRCF projects have covered the following technology sectors: advanced manufacturing, aerospace, communications, cyber security, energy, environment, information technology – including data analytics, life sciences, modeling and simulation, nuclear physics, transportation, and unmanned systems.

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.

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 (also known as Virginia Catalyst and VBHRC), a translational human health research accelerator program targeting collaboration between Virginia research universities and industry, the Virginia Research Investment Fund (VRIF), a state-created program for universities that seeks to foster economic development and job creation through public-private collaborate R&D and commercialization efforts,

[2] 272 projects were selected for funding since CRCF's inception; 15 awards have been declined

and the Commonwealth Health Research Board (CHRB), which supports research efforts that have the potential to maximize human health benefits for Virginia citizens.

One solicitation was offered in FY2017 and included five programs: Commercialization, Eminent Researcher Recruitment, Matching Funds, SBIR Matching Funds, and STTR Matching Funds. Applications were invited from academia, federal labs, other nonprofit research institutions, university research consortia, and the private sector.

- **Commercialization Program**
  Supported high-potential 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 for-profit firms could have received no more than $2 million in outside private investment, had cumulative commercial revenue no more than $3 million over the last five years, and could have received no more than ten SBIR and/or STTR awards.

- **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.

- **Matching Funds Program**
  Enabled public and private colleges and universities, federal labs and other nonprofit research institutions in Virginia, and university research consortia that include Virginia college and university member institutions to leverage federal and private funds designated for the commercialization of high-potential qualified research or technologies.

- **SBIR and STTR Matching Funds Programs**
  Advanced high-potential technology commercialization and technology development efforts by Virginia-based technology businesses that had recently won a Phase I and/or Phase II Small Business Innovative Research (SBIR) or Small Business Technology Transfer (STTR) award; awards could, for example, fill the gap between Phase submissions and/or assist with commercialization activities not supported by the federal award. Eligible firms could have received no more than five SBIR or STTR awards if applying to CRCF with a Phase I award and/or no more than ten SBIR or STTR awards if applying with a Phase II award, among other eligibility criteria.

Seven technology sectors were eligible for funding in FY2017: advanced manufacturing, cyber security, energy, environment – with a focus on water quality only, information technology, life sciences, and unmanned systems.

In FY2017, CIT received 166 applications – a 12.2% increase in submissions over FY2016, and an 88.6% increase in submissions over FY2015. Moreover, applications in FY2017 were received from 118 discrete organizations – a 15.7% increase in discrete applicants over FY2016 and a 103.5% increase over FY2015.

Applicants requested nearly $10.5 million and spanned all programs, industry sectors, and the Commonwealth's ten technology regions / nine GO Virginia regions. Forty awards were announced for $2,694,437; 39 awardees accepted funding. The recipient declined an award in FY2017 because of a wholesale change in project direction, IP, personnel, and location of the work to be performed. Awarded projects represented five of the ten technology council regions, six of the nine GO Virginia regions, and all eligible and strategically important industry sectors.

FY2017 CRCF awards, along with awards made since the program's inception, address a breadth of critical research areas. Energy-focused projects seek to make HVAC and building operations more efficient, while projects focused on water quality aim to reduce nitrogen and phosphorus inputs to Virginia's waterways and detect lead in drinking water. Projects in life sciences, a robust industry and important sector for many award recipients, range from new testing for gluten allergies to wound care to assistive vision technology for the blind. Game-changing cyber security, IT, and autonomous vehicle technologies will also be validated through FY2017 projects.

CRCF awards were approved 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 comprised of representatives drawn from higher education, economic development, research institutes, venture capital firms, and technology corporations. The list of FY2017 RTIAC members is included as Appendix B.

A brief overview of each project announced for award in FY2017 is provided in Appendix A.

FY2017 Program Administration

Administrative activities in FY2017 included overseeing the solicitation and RTIAC, outreach, and award management for projects funded in FY2012 through FY2016. CIT received $304,134 for Fund management.

As Fund Administrator and with the support of the RTIAC and Office of the Secretary of Technology, CIT developed the approach for the FY2017 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 255 Letters of Intent (LOIs) – approximately 30% more than the number received in FY2016 and 140% more than FY2015 – 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 award decisions, after which awards were announced.

CIT maintains information on the Fund, including solicitations and awards, on its website. In FY2017, press releases announced the request for proposals and, subsequently, award recipients. Outreach and communications also included social media, email announcements, webinars, and speaking engagements. Outreach efforts were supplemented by additional communication networks, including CIT's GAP and MACH37™ teams; Virginia's regional technology councils; individual colleges and universities, research organizations, and federal labs; the Virginia Biotechnology Association (VABIO) and numerous other professional societies and trade associations; the Virginia Economic Developers Association (VEDA); the Virginia Economic Development Partnership (VEDP); and the Administration.

Also as Fund Administrator, CIT managed awards announced in prior years and produced the FY2016 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. Throughout the year, CIT provided oversight to ensure compliance with the CRCF guidelines and other requirements.

Preparations for FY2018

The General Assembly and Administration appropriated $2.8 million to CRCF for FY2018, and CIT began planning for a new solicitation 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: FY2017 Award Details

Award Recipient	Project Title	Project Description	Period of Performance	Principal Investigator	CRCF Award	Match
COMMERCIALIZATION PROGRAM						
418 Intelligence Corp.	*Development of a Reusable Cyber Tournament Module for Competition Based Analyst Skill Development*	418 Intelligence is developing a novel game for cyber intrusion analysis that will enhance and accelerate cyber skills development at scale to help in closing the skills gap for employers. CRCF funding will be used to develop and test a prototype game module and user experience that will be reusable with different malware samples and network packet data files.	7/10/2017 – 10/27/2017	Mr. Mark Jaster	$50,000	$50,000
Altede LLC	*Altede – Allergy Test Development: Fast, Easy and Affordable Tests for Food Allergens, Starting with Gluten*	Altede will use CRCF funding to develop, validate, and market a test to detect gluten in food. The company plans to expand the test to include other food allergens.	6/19/2017 – 1/19/2018	Mr. Edward Champion	$50,000	$50,000
Arcus Analytics *	*An Integrated Data Management Platform for Maintaining Civil Infrastructure*	Arcus Analytics aims to provide a new and more comprehensive approach to infrastructure asset management through the development of an integrated data management platform that supports the use of advanced visualization, data analytics, and virtual and augmented reality.	7/1/2017 – 12/31/2017	Mr. David Perkins	$49,909 *	$49,963 *
Contraline, LLC	*Development of a Photoreversible, Vas-Occlusive Male Contraceptive*	Contraline is developing a long-lasting, non-hormonal, and reversible male contraceptive. Through this CRCF project, the team will demonstrate proof-of-concept of the product and optimize the formulation for commercialization.	7/1/2017 – 6/1/2018	Mr. Kevin Eisenfrats	$50,000	$80,212

Award Recipient	Project Title	Project Description	Period of Performance	Principal Investigator	CRCF Award	Match
Counter-Drone Research Corporation	*Rogue UAS Detection and Interdiction – Mobile Prototype Development*	The goal of CDRC's project is to develop radio frequency-based mobile prototype technology for autonomously detecting and localizing rogue UAS, then remotely seizing control of the aircraft to force a safe landing.	7/1/2017 – 6/30/2018	Mr. Timothy O'Shea	$50,000	$50,000
DHK Storage, LLC	*Data Center Power Efficiency and Cooling*	DHK Storage seeks to manufacture and test its data center cooling system, a proof-of-concept technology that delivers substantial cooling while lowering the cost of data center server operations.	6/16/2017 – 3/31/2018	Mr. David Klein	$50,000	$50,000
Excavation Alert Systems, LLC	*SignalTape Utility Protection System*	Excavation Alert Systems is developing a next-generation damage prevention system for buried utilities that provides obvious warning signals directly to excavation crews, without requiring additional compliance or proactivity. During this CRCF project the team will perform environmental longevity and safety testing needed to commercialize the product.	7/3/2017 – 6/29/2018	Mr. Ryan Dunn	$25,000	$50,000
FluxTeq LLC	*Inexpensive BTU Meter Used to Increase Building Energy Efficiency*	FluxTeq proposes to develop a novel, inexpensive BTU meter system to measure thermal energy being distributed throughout a building by the HVAC system.	7/1/2017 – 6/30/2018	Mr. Rande Cherry	$46,650	$54,108
GreenOps Ammo Inc.	*Commercialization of Environmentally Benign Shotgun Ammunition*	GreenOps Ammo, a spin-off company established to commercialize CRCF-supported biodegradable shotgun wads, intends to advance the technology closer to market through technical and stability improvements and pilot production and testing.	6/16/2017 – 12/31/2017	Mr. Jason McDevitt	$49,600	$78,120

Award Recipient	Project Title	Project Description	Period of Performance	Principal Investigator	CRCF Award	Match
Land Design Technologies LLC	*Storm Quality Quantity Toolset (Storm Q2) Software Development*	Land Design Technologies will enhance their software technology to improve the Virginia Runoff Reduction Method for new or redevelopment sites. The software optimizes which storm water Best Management Practices would be best for developers and municipalities to use on their sites.	7/1/2017 – 6/30/2018	Dr. Randy Dymond	$50,000	$65,000
metallum3d Inc.	*Microwave Densification for Metal 3D Printing*	Current metal 3D printing technology suffers from high equipment costs, material costs, and processing costs. metallum3d had developed a novel microwave densification process to significantly lower the cost of metal 3D printing. CRCF funding allows the team to continue development and testing of this process.	6/16/2017 – 12/31/2017	Mr. Nelson Zambrana	$50,000	$61,300
RTM Vaccines	*Human Lyme Vaccine Proof of Concept for Commercial Development*	The objective of RTM's project is to develop a therapeutic vaccine for Lyme disease (LD) that can be used to treat established LD infections in humans and companion animals.	6/16/2017 – 6/15/2018	Dr. Richard Marconi	$50,000	$50,000
Sonotherm LLC	*Energy Efficient, Ductless HVAC System Using Thermoacoustic Technology*	With CRCF funding, Sonotherm will design and manufacture a product that uses thermoacoustics – using sound waves to heat and cool air.	6/16/2017 – 3/15/2018	Dr. Don Jordan	$49,466	$78,905
Spheringenics, Inc.	*Product Development for a Sustained Release Biologic Delivery System*	This project seeks to address healing for chronic, ischemic wounds using alginate microbead technology for delivery of human growth factors. Specifically, CRCF funds will demonstrate safety and storage for the delivery of these growth factors. This project is complimentary to Spheringenics' second	7/1/2017 – 7/1/2018	Dr. Christopher Dosier	$50,000	$170,157

Award Recipient	Project Title	Project Description	Period of Performance	Principal Investigator	CRCF Award	Match
		awarded project, under the SBIR Matching Funds Program.				
TruWeather Solutions	*Micro Road Weather Data to Accelerate Fielding of Autonomous Transportation Vehicle*	TruWeather Solutions seeks to demonstrate that available science and technology can significantly improve road weather hazard identification and transmit hazard alerts and advisories to moving or stationary vehicles within ten miles of the hazard, in near real time.	7/1/2017 – 6/30/2018	Mr. Donald Berchoff	$50,000	$50,682
Ultrasonic Probe LLC	*Periodontal Probe Based on Ultrasound Technology*	With the help of previous CRCF funds, Ultrasonic Probe developed end-user software for periodontal charting. FY2017 funding will allow the team to build a working prototype of a new dental diagnostic tool that will improve the diagnosis of periodontal disease and improve health outcomes.	6/16/2017 – 12/31/2017	Mr. Jack Singer	$25,000	$25,000
TOTAL COMMERCIALIZATION PROGRAM AWARDS:					**$745,625**	
TOTAL COMMERCIALIZATION PROGRAM MATCHING FUNDS:					**$1,013,447**	
EMINENT RESEARCHER RECRUITMENT PROGRAM						
George Mason University	*Recruitment of Eminent Scholar in Bioengineering in Partnership with INOVA Health System*	George Mason University received CRCF funds to support the recruitment of an Eminent Researcher in Bioengineering. The Researcher, with a strong track record in translational research and technology commercialization, will play a leadership role in assuring the success of Mason's new multidisciplinary Institute for Biomedical Innovation and will be critical to fueling continuing growth in Mason's translational research portfolio. Mason is collaborating with the Inova Health System for this recruitment.	7/1/2017 – 6/30/2019	Dr. Kenneth Ball	$250,000	$250,000
TOTAL EMINENT RESEARCHER RECRUITMENT PROGRAM AWARDS:					**$250,000**	
TOTAL EMINENT RESEARCHER RECRUITMENT PROGRAM MATCHING FUNDS:					**$250,000**	

Award Recipient	Project Title	Project Description	Period of Performance	Principal Investigator	CRCF Award	Match
MATCHING FUNDS PROGRAM						
College of William & Mary	*Manufacturing of Boron Nitride Nanotube-Based Thermal Management Materials for High-Performance Electronics*	Through this project, W&M will develop a prototype boron nitride nanotubes (BNNT) / polymer nanocomposite with maximal thermal performance to demonstrate the potential of these materials for thermal management applications.	7/1/2017 – 6/30/2018	Dr. Hannes Schniepp	$100,000	$102,758
Eastern Virginia Medical School	*Screening for Safe Biochemical Methods to Induce Expression of Tissue Repair Protein*	With CRCF support, EVMS seeks to develop a "repair-induction combo" by screening for a toll-like receptor 4 (TLR4) inhibitor / TRIM72 inducer combination that boosts tissue repair in a safe way. TRIM72 is a protein that remedies injury to cells and reduces tissue injury.	7/1/2017 – 6/30/2018	Dr. Xiaoli Zhao	$100,000	$100,000
George Mason University	*Development of DRGN1, a Komodo Dragon-Inspired Peptide for Wound Care*	This Mason team has developed a novel, synthetic, small peptide (DRGN-1) that promotes healing in both infected and uninfected wounds. CRCF funding will be used to develop DRGN-1 into an advanced topical wound-care treatment.	7/1/2017 – 6/30/2018	Dr. Monique van Hoek	$100,000	$100,000
George Mason University	*A Multiplexing Photoacoustic Theranostic System for Treatment of Breast Cancer*	Mason aims to develop a novel, targeted cancer theranostics system for the diagnosis and treatment of breast cancer that uses polymer-based nanoparticles.	6/16/2017 – 12/31/2018	Dr. Carolina Salvador-Morales	$99,989	$99,989
University of Virginia	*Development of a Device to Improve Lithium-Ion Battery Reliability*	The overall goal of this UVa project is to further the technical development and fundamental understanding of a novel technology that aims to improve the reliability of lithium-ion batteries through improvements in quality control used in battery manufacturing. CRCF funds will accelerate the development of a prototype device.	7/1/2017 – 6/30/2018	Dr. Gary Koenig	$100,000	$100,000

Award Recipient	Project Title	Project Description	Period of Performance	Principal Investigator	CRCF Award	Match
University of Virginia	*Fiber-Optic Based Thermoreflectance and Optical Property Measurement System*	This proposal is aimed at further developing the fiber-optic-based measurement tool funded in a prior CRCF round. Specifically, UVa proposes to extend a prototype of a fiber-optic-based thermoreflectance and optical property measurement system toward a commercial product.	7/1/2017 – 6/30/2018	Dr. Patrick Hopkins	$100,000	$100,000
University of Virginia	*High-Bandwidth Line-Speed Network-Processing Framework*	This project proposes to leverage an existing grant to extend FPGA research and develop an FPGA-accelerated, network-centric, application-analytics framework (prototype) to support a variety of sophisticated, line-speed analytics on data aggregated from multiple high-speed network streams.	7/1/2017 – 6/30/2018	Dr. Kevin Skadron	$100,000	$100,000
Virginia Commonwealth University	*Development of Highly Efficient Materials for the Conversion of Solar Energy into Heat for Domestic Water Heating and Solar Water*	VCU aims to advance the development of a new generation of highly efficient, flexible, low weight, and cost-effective Graphene Polymer Nanocomposite and Plasmonic Graphene Polymer Nanocomposite materials for Solar Domestic Hot Water and Solar Water Desalination.	7/1/2017 – 6/30/2018	Dr. M. Samy El-Shall	$100,000	$100,000
Virginia Commonwealth University	*Dual Function Anti-Metastatic Agents for Triple Negative Breast Cancer Treatment*	This project will advance toward human clinical trials a dual-function anti-cancer agent combining cytotoxicity with anti-angiogenic and anti-metastatic activity. The primary objective is to confirm the anti-metastatic potential of candidate agent in triple negative breast cancer, creating the necessary next steps for clinical development and licensing.	7/1/2017 – 6/30/2018	Dr. Nicholas Farrell	$100,000	$100,000

Virginia Institute of Marine Science	*An Innovative Mechanism for Reducing Nitrogen and Phosphorus Inputs to Virginia Waters*	To reduce pollution loads into waterways, VIMS will utilize a proprietary blend of natural ingredients. The project aims to scale up production of mesh tiles for *in situ* testing along highway drainage systems and to determine the extent to which tile placement within roadside drainage swales reduces nitrogen and phosphorus pollution, particularly for drainages that feed into impaired river systems.	6/16/2017 – 6/15/2018	Dr. Kirk Havens	$99,450	$99,450
Virginia Tech	*Computed Tomography Without Moving Parts for Fast and Portable Biomedical Imaging*	The goal of this project is to develop an imaging device that will enable highly efficient and cost-effective small animal imaging. The outcome will be a proof-of-concept micro-CT imaging system with "stop-action" imaging speed to take a tomographic snapshot of a free-moving animal without anesthetization.	7/1/2017 – 6/30/2018	Dr. Guohua Cao	$100,000	$100,000
				TOTAL MATCHING FUNDS PROGRAM AWARDS:	**$1,099,439**	
				TOTAL MATCHING FUNDS PROGRAM MATCHING FUNDS:	**$1,102,197**	
SBIR MATCHING FUNDS PROGRAM **						
Cerillo, LLC	*Improvement of a Miniaturized Multiwell Plate Reader*	Cerillo has developed a device to track the growth of many biological samples in a format much smaller than currently available devices. SBIR Phase I funding will allow for the development of the proof-of-concept device with full functionality and marketability. CRCF funding will further supplement the process by expanding the technology for multiple measurement wavelengths.	8/1/2017 – 3/1/2018	Mr. Kevin Seitter	$50,000	$225,000
dbS Productions LLC	*Integration of Enhanced UAV Sensor Sweep Widths with Search & Rescue FIND Software*	dbS Productions is currently developing search and rescue software called FIND with the assistance of a Phase IIB SBIR from DHS S&T. The goal of the CRCF project is to fully integrate the use of UAVs	7/1/2017 – 7/1/2018	Mr. Robert Koester	$50,000	$250,000

		into the search process to use all possible tools to locate a missing person.				
Ghodousi, LLC	*Assistive Digital Vision for the Blind*	In conjunction with SBIR Phase II funding, Ghodousi is developing a prototype pair of glasses equipped with a camera and sonar, capable of recognizing objects and detecting obstacles, with the purpose of enhancing the mobility independence of the blind. CRCF funding augments the SBIR project by incorporating a voice recognition capability to improve functionality and user experience.	7/1/2017 – 13/31/2017	Dr. Arman Ghodousi	$49,940	$730,331
NanoSafe Inc.	*Mobile Analytical Platform for Lead Detection in Drinking Water*	NanoSafe is developing a platform technology capable of accurately measuring lead concentrations in drinking water that will be accessible to every household across the country.	6/16/2017 – 12/16/2017	Dr. Cary Hill	$50,000	$99,934
Service Robotics & Technologies	*SRT's Map-based Facility Management System for Robots and Smart Devices*	Through an NSF SBIR Phase I, SRT is finalizing development of a software framework and a standardized robotics communication protocol that allows smart hardware devices from different manufacturers to share data and operate in the same software architecture. With CRCF funding, the team will develop an unmanned systems and smart device software control platform and will integrate disparate hardware platforms into a centralized dashboard, allowing for a wide variety of systems to be controlled and monitored by a single user.	6/16/2017 – 5/31/2018	Dr. Gregory Scott	$50,000	$240,000
SoundPipe LLC	*Enhanced Drug Delivery with GUIDE-Tx and Microbubbles*	With SBIR Phase I support from NSF, SoundPipe will create software for dose control to provide custom therapies and uniform dosing along long peripheral arteries, reducing the technical risk of dose control with image feedback. CRCF funding will supplement the project by	7/1/2017 – 1/1/2018	Dr. Joseph Kilroy	$50,000	$225,000

		creating novel limus-loaded microbubbles for drug delivery to vessel walls to prevent neointimal hyperplasia.				
Spheringenics, Inc.	*Sustained Release Delivery System for Treatment of Chronic Wounds*	Spheringenics is currently working on a Defense Health Program Phase IIB project to develop a biologic delivery system to facilitate cartilage and skin regeneration in a clinically relevant animal model. CRCF funds will allow the team to further apply the alginate microbead technology in the treatment of challenging wounds, namely ischemic wounds. This project is complementary to Spheringenics' second awarded project under the Commercialization Program.	7/1/2017 – 7/1/2018	Dr. Christopher Dosier	$50,000	$1,100,403
Springbok, Inc.	*A Non-Invasive Image-based Skeletal Muscle Analytics Tool*	The goal of Springbok's SBIR Phase I project is to develop a new tool to reveal information regarding skeletal muscle strength and health using an image-to-model pipeline. CRCF funding will allow the team to develop an app that can run on multiple platforms to facilitate data transfer and display results and integrate the app with image segmentation and data analysis algorithms to improve the efficiency and robustness of the production.	6/16/2017 – 6/15/2018	Dr. Xue Feng	$50,000	$747,567
SynaptiCAD	*Commercialization of Blockchain Technologies*	SynaptiCAD has received a Phase I award from DARPA to explore the use of blockchain technologies for communication and transactions between DoD agencies or personnel, specifically to create a secure information platform based on existing, proven blockchain codebase. SynaptiCAD intends to use CRCF funds to create a similar secure communications and transaction capability for businesses.	7/1/2017 – 12/31/2017	Dr. Peter Menegay	$49,783	$99,205

				TOTAL SBIR MATCHING FUNDS PROGRAM AWARDS:	**$449,723**	
				TOTAL SBIR MATCHING FUNDS PROGRAM MATCHING FUNDS:	**$3,717,490**	
STTR MATCHING FUNDS PROGRAM **						
Acomhal Research, Inc.	*Development of Biodegradable Nanoparticles Encapsulating a Novel Therapeutic Peptide to Eradicate Glioblastoma Cancer Stem*	Acomhal Research has identified a novel and potent therapeutic peptide to prevent glioblastoma progression and recurrence by targeting glioma cancer stem cell viability and self-renewal. CRCF funds will bridge the gap between the STTR R&D work and future canine clinical trials.	7/1/2017 – 6/30/2018	Dr. Samy Lamouille	$50,000	$224,999
BEM Controls, LLC	*An Agent-based Self-learning System for Efficient Building Operations and Automated Participation in Electricity Markets*	BEM Controls, supported by NSF STTR Phase I funding, has developed a platform capable of monitoring and controlling HVAC, lighting and plug loads, and communicating with sensors and IoT devices in buildings. CRCF funds will be used to extend the capability of this platform by integrating distributed energy resources and developing control algorithms.	7/1/2017 – 12/31/2017	Dr. Saifur Rahman	$49,650	$224,673
ElectraWatch, Inc.	*Field Probe to Measure Degree of Sensitization (DoS) of 5XXX Aluminum Alloys*	ElectraWatch's U.S. Navy STTR project expands the use of the Degree of Sensitization (DoS) Probe through additional calibration, testing, and commercialization. CRCF will allow the company to further engage with potential non-Navy markets.	7/3/2017 – 6/29/2018	Mr. Ryan Dunn	$50,000	$550,000 †
				TOTAL STTR MATCHING FUNDS PROGRAM AWARDS:	**$149,650**	
				TOTAL STTR MATCHING FUNDS PROGRAM MATCHING FUNDS:	**$999,672**	
				TOTAL CRCF FY2017 AWARDS:	**$2,694,437**	
				TOTAL CRCF FY2017 MATCHING FUNDS:	**$7,082,806**	

FY2017 Funding Totals

PROGRAM	FY2017 AWARD COUNT	FY2017 AWARD TOTAL	FY2017 MATCH TOTAL
Commercialization Program	16	$745,625	$1,013,447
Eminent Researcher Recruitment Program	1	$250,000	$250,000
Matching Funds Program	11	$1,099,439	$1,102,197
SBIR Matching Funds Program	9	$449,723	$3,717,490
STTR Matching Funds Program	3	$149,650	$999,672
ALL PROGRAMS	**40**	**$2,694,437**	**$7,082,806**

* Indicates declined award

** Matching funds provided toward the CRCF project are the federal SBIR / STTR awards and may include additional awardee-contributed match

† SBIR or STTR award is pending; figure is projected

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 FY2017.

- **Steve Clinton,** former Vice President and COO – Sebesta, Inc. (*retired*)
- **Deborah Crawford,** Vice President for Research – George Mason University
- **Morris Foster**, Vice President for Research – Old Dominion University
- **Cheryl Giggetts,** Senior Vice President – AECOM, Technology Solutions
- **Dan Gundersen**, Interim President and CEO – Virginia Economic Development Partnership [3]
- **Yvonne Harris,** Vice Provost for Research and Scholarship – James Madison University
- **Bob Kahn**, Chairman, CEO, & President – Corporation for National Research Initiatives
- **Dennis Manos**, Vice Provost for Research and Graduate/Professional Studies – College of William and Mary
- **Steven Moret**, President and CEO, Virginia Economic Development Partnership[3]
- **Venkat Rao,** Director, Chem-Bio Programs – Parsons
- **Scott Tolleson,** Managing Director – NRV

[3] Mr. Moret replaced Mr. Gundersen by virtue of position in March 2017