Commonwealth Research Commercialization Fund

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

ANNUAL REPORT

July 1, 2018 – June 30, 2019

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

October 1, 2019

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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 FY2019.

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. Since its inception in FY2012, nearly 350 projects around the Commonwealth totaling close to $28 million have been approved for funding.

Economic outcomes reported in FY2019 by CRCF award recipients identified early returns on the Commonwealth's investment: approximately $117 million in follow-on monies to support further technology advancement, nearly $2 million in in-kind contributions, ten new companies formed, and approximately 50 products or services launched in the market. In support of the Fund's goal to commercialize high-potential technology, annual outcomes reported by awardees reflect the maturation and evolution of an organization and its technology as they advance toward market entry. Outcomes are discussed below.

In FY2019, CIT offered one CRCF solicitation, which resulted in 41 awards[1] totaling $2.51 million and leveraging the Commonwealth's investment with nearly $6 million in matching funds. These projects, along with those in the CRCF portfolio, 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 current Commonwealth Research and Technology Strategic Roadmap.

The program was supported by a $2.8 million FY2019 General Fund appropriation. Funds available to award also reflected CIT's administrative fee and 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, cybersecurity, advanced manufacturing, energy, and unmanned systems. CRCF awards, for instance, hold promise in life sciences 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. Cybersecurity continues to be a critical focus of CRCF projects, from products performing cybersecurity assessments and identifying malicious activity to solutions that identify and measure security vulnerabilities of organizations' IT infrastructures and secure networks

[1] 41 projects were selected for funding; two organizations declined their awards

and establish patterns to speed up incident remediation and prevent future attacks. Additional technologies, such as oyster breeding to improve disease resistance and support oyster aquaculture, 3D modeling and simulation software for homeland security, energy harvesting devices, and autonomous vehicle sensing and detection 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 or prototype development stages or earlier, setting the technology on a commercialization path and making it attractive for further investment and/or licensing. Milestones along this often 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. FY2019 reports submitted by award recipients demonstrate exciting returns on investment for the Commonwealth, and aggregate figures are outlined below.

- **Additional funding leveraged.** CRCF award recipients reported attracting approximately $117 million in follow-on monies to support research and technology efforts after their CRCF projects concluded. Sources of funding ranged from angel and venture capital investors to corporate partners to grants from federal agencies.[2] An additional $2 million was leveraged from in-kind support and more than $59 million has been reported as pending.

- **Organizational growth and expansion.** In FY2019, at least ten new companies were formed to commercialize or otherwise extend the reach of CRCF-developed technologies, two companies were acquired, and at least 25 organizations expanded, established, or enhanced facilities. Two hundred new jobs were reported, including full-time and part-time positions, and with hires ranging from students supporting a specific project to senior-level executives to consultants; 137 jobs with a similar spectrum were reported as retained. CRCF awardees recorded more than $33 million in sales revenue over the past year, with six organizations each reporting figures of more than $1.5 million. In fact, four organizations had revenue greater than $2 million, and one organization reported revenue of $14 million.

- **Products/services introduced to market.** More than 50 new products and/or services have been introduced to market, as reported by CRCF awardees in FY2019, and nearly 80 products and/or services are anticipated for release in the next 12 months. Twenty-eight additional technologies were reported as under development, including at the beta, demo, or prototype stage, as well as in pilot programs.

[2] Of this follow-on funding total, $40 million was raised by FirstString Research, Inc., a company connected to 2014 CRCF Eminent Researcher, Dr. Robert Gourdie.

- **Intellectual property created and licensed.** CRCF award recipients reported 18 patents granted and more than 165 patents filed or pending; this includes U.S., International, PCT, and provisional patents. Additionally, ten invention disclosures were reported, along with several trade secrets. Several organizations are actively pursuing licensing agreements for their technology.

- **Regulatory applications and approvals.** Fund recipients reported that five clinical trials or studies were completed, underway, or recently approved and, additionally, at least four organizations reported technologies that were on the path to FDA approval(s) as devices, drugs, investigational new drugs (INDs), and new chemical entities (NCEs).

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 FY2019, reports indicated numerous awardees engaged in creating and licensing IP. Additionally, since FY2015, awardees have reported more than $457 million in follow-on funding, more than $18 million of in-kind support, more than $88 million in sales and revenue, and more than 1,460 jobs created and retained[3].

Program Overview

Since the inception of the CRCF program in FY2012, 1,013 applications were submitted from all nine GO Virginia regions and, from these submissions, 348[4] projects were offered funding. These awards total nearly $28 million and are being leveraged with more than $72 million in committed matching funds, including federal awards. CRCF projects have covered the following technology sectors: advanced manufacturing, aerospace, communications, cybersecurity, 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, funding for CRCF projects supports 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, for instance, with the Federal Funding Assistance Program (FFAP), the GAP family of funds, and the Virginia Unmanned Systems Center. CRCF also complements

[3] Corrections were made to the comprehensive figures reported in the FY2018 Annual Report and are reflected in the FY2019 comprehensive figures provided here.
[4] 348 projects were offered funding since CRCF's inception; 20 awards have been declined.

other funding programs in the Commonwealth, such as the Virginia Catalyst (formerly known as VBHRC, the Virginia Biosciences Health Research Corporation), the Virginia Research Investment Fund (VRIF), the Commonwealth Health Research Board (CHRB), and the Tobacco Region Revitalization Commission.

FY2019 Solicitation

One solicitation was offered in FY2019 that 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 or prototype development phases that had a reasonable probability of enhancing the Commonwealth's national and global competitiveness. Eligible companies could have received no more than: $5 million in combined outside private investment and cumulative sales revenue over the last five years, eight SBIR and/or STTR awards, and two prior CRCF 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. Research commercialization and collaboration with the private sector are important activities for the eminent researcher.

- **Matching Funds Program**
  Enabled public and private higher education institutions, 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 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. Eligible firms could have received as many as five SBIR or STTR awards if applying to CRCF with a Phase I award and/or as many as eight SBIR or STTR awards if applying with a Phase II award, among other eligibility criteria.

Five technology sectors were eligible for funding in FY2019: clean energy, cybersecurity, data analytics, life sciences, and unmanned systems.

In FY2019, CIT received 175 eligible Letters of Intent (LOIs) in response to the Request for Proposals (RFP). Of these, 113 applications were submitted from 97 discrete organizations and 113 discrete Principal Investigators. Applicants requested approximately $7 million and these requests spanned all programs and industry sectors and eight of the nine GO Virginia regions. Forty-one awards were announced for $2.51 million; two award recipients declined funding. These awards leverage the Commonwealth's investment with nearly $6 million in matching funds. Awarded projects represented all industry sectors, three of the five programs, and seven of the nine GO Virginia regions.

A brief overview of each project announced for award in FY2019 is provided in Appendix A.

Program Administration

Administrative activities in FY2019 included overseeing the solicitation and RTIAC, outreach, and award management for projects funded in FY2012 through FY2018. The fee for Fund management was $353,696.

As Fund Administrator and with the support of the RTIAC and Office of the Secretary of Commerce and Trade, CIT developed the approach for the FY2019 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 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, a legislatively-established body comprised of representatives drawn from higher education, economic development, research institutes, venture capital firms, and technology corporations. The list of FY2019 RTIAC members is included as Appendix B. The RTIAC assessed projects and recommended to the CIT Board of Directors those that 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 FY2019, 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 was enhanced by additional communication networks, including CIT's GAP team, FFAP, and the Virginia Unmanned Systems Center; 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.

Following the Governor's June 2019 press release announcing awards, CIT's Marketing and Communications team engaged in outreach to local media outlets, an activity that had not been pursued in prior years. As a result, a number of local newspapers and other publications, radio stations, and

television stations picked up the stories and did features on the CRCF program and the local award recipients. A Charlottesville radio station, WINA, interviewed Secretary of Commerce and Trade, Brian Ball, bringing additional recognition and exposure to the Fund.

Also as Fund Administrator, CIT managed awards announced in prior years and produced the FY2018 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 FY2020

The General Assembly and Administration appropriated $2.8 million to CRCF for FY2020, and CIT began planning for a new solicitation early in the fiscal year.

The Fund Administrator will continue to monitor projects and will report outcomes following their period of performance ends in order to capture commercialization and economic results, including job and company creation, and new revenue.

APPENDIX A: FY2019 Award Details

Award Recipient	Project Title	Project Description	Period of Performance	Principal Investigator	CRCF Award	Match
COMMERCIALIZATION PROGRAM						
AgroSpheres Inc.	*AgroSpheres Enhanced Delivery of Active Ingredients*	In part through a prior CRCF award, AgroSpheres demonstrated its ability to improve crop protection by increasing traditional pesticide efficacy and mitigating the environmental footprint through the encapsulation of pesticides. With FY2019 funding, the company plans to create a more specific and selective targeted bioparticle for the delivery of crop protectants to the internal plant system.	06/17/2019 – 04/17/2020	Dr. Mark Kester	$50,000	$50,000
Amruta Inc	*Self-Learning System for e-Discovery, Among Large Text Corpus Data Sets to Improve Compliance, Forensics, and Customer Service, Using Machine Learning*	As the number of documents and volume of text logs increase due to organizational activities and internal and external interactions, e-discovery can serve as an important utility to uncover and detect non-compliant incidences and customer needs. With CRCF funding, Amruta will develop an early-stage commercial product wherein the system continuously adapts to suggest recommendations to maximize the discovery of insightful perils or needs that have a high impact.	06/17/2019 – 12/16/2019	Dr. Beju Rao	$50,000	$53,000
AVEC, Inc.*	*Advancement of Software-Based Noise Prediction Tools for Multirotor Aircraft*	AVEC proposes to develop a software package to accurately predict the noise created by multi-rotor UAVs during the design phase, potentially reducing overall development costs and providing for quieter vehicles in the public airspace.	08/01/2019 – 05/01/2020	Mr. Kyle Schwartz	$49,997	$1,007,988

Award Recipient	Project Title	Project Description	Period of Performance	Principal Investigator	CRCF Award	Match
BEAM Diagnostics, Inc	*Using Behavioral Economics to Identify Best-Fit Personality Profiles Among Employment-Seeking Individuals*	In this project, BEAM Diagnostics proposes to conduct a proof-of-concept investigation, based on human resource manager expert input, to demonstrate the predictive validity of a theoretically-based pre-employment screening tool to identify the propensity to engage in counterproductive work behaviors among job applicants.	06/17/2019 – 12/31/2019	Dr. Sarah Snider	$29,750	$29,899
Casper Drones*	*An Unmanned Aerial System to Peacefully Fly Around People*	Though drones are powerful tools for business, research shows that liability and safety concerns deter managers from adopting the technology. In response, Casper Drones has built an innovative, bladeless drone. The objective for this project is to take the Casper Drone from an MVP and bring it to market.	06/17/2019 – 11/15/2019	Dr. Max DePiro	$48,400	$48,400
Eksdyne Inc.	*Integrated System for Evolving Developing Devices*	Eksdyne proposes to develop and commercialize a novel platform for the development of fully integrated devices, through a guided evolutionary process that utilizes accurate physical simulation of an entire physical scene. The platform will streamline the design process to eliminate untenable or undesirable designs through testing and simulation, before physical production.	06/17/2019 – 06/16/2020	Mr. Joshua Eckstein	$49,936	$67,680
Embody LLC	*Additive Manufacturing of Collagen Microfibers as an Internal Brace for Regenerating Ligaments of the Knee*	Through Embody's second CRCF award in as many years, the company will focus on product development of a tissue engineering pure collagen microfiber as a ligament internal brace to repair ACL and other ligament injuries.	06/17/2019 – 06/17/2020	Dr. Michael Francis	$50,000	$100,000

Award Recipient	Project Title	Project Description	Period of Performance	Principal Investigator	CRCF Award	Match
G2 Ops Global, Inc.	*A Model-Based Framework for Quantifying Information Risk*	Modeling provides a baseline data set to perform simulation of the evolving cyber threat landscape and analytics for continuous evaluation. G2 Ops Global's Unified Risk Management software aligns business operations to technology assets and quantitatively reports losses associated with cyber risks and breaches in monetary terms. CRCF funding will be used to complete prototype development, conduct alpha and beta testing, and release the MVP.	07/01/2019 – 03/31/2020	Ms. Corren McCoy	$42,984	$75,968
MOVA Technologies, Inc.	*Panel-Bed Filter Proof-of-Concept Testing*	MOVA is developing its panel-bed filter designed to capture and segment pollutants released during energy production in a way that allows the pollutants to be recycled for further industry use.	07/01/2019 – 03/10/2020	Mr. James Compton	$50,000	$133,656
NIRSleep Inc	*Home Sleep Monitoring with a Compact and Inexpensive Wearable Neuro-Imaging Device*	Sleep disorders affect over a third of American adults. NIRSleep is developing a more ecologically-valid method to remotely monitor sleep in at-risk populations in order to provide greater insight for care providers and better outcomes for patients.	08/01/2019 – 07/31/2020	Dr. Ryan Casey Boutwell	$50,000	$107,486
Overa, Inc.	*Development of a Non-Hormonal Female Contraceptive Using an Egg-Specific Antibody-Drug Conjugate*	Overa, Inc. is a biopharmaceutical company based in Charlottesville focused on developing a novel, non-hormonal female contraceptive. In this proposal, the company will conduct critical proof-of-concept studies that will demonstrate the ability of their antibody-based drug to target human egg cells and put them into stasis, thereby preventing fertilization.	06/17/2019 – 06/16/2020	Dr. David Kroeger	$50,000	$61,983

Award Recipient	Project Title	Project Description	Period of Performance	Principal Investigator	CRCF Award	Match
ReAlta Life Sciences	*Peptide Inhibitor of Complement C1 (PIC1) as a Treatment for Autoimmune Hemolytic Anemia in Patients with Systemic Lupus Erythematosus*	The proposed research will evaluate the ability of the inflammatory inhibitor, Peptide Inhibitor of Complement C1 (PIC1), for the treatment of autoimmune hemolytic anemia (AIHA) in patients with Systemic Lupus Erythematosus (SLE). The team hypothesizes that PIC1 will be able to inhibit hemolysis almost immediately for these patients decreasing the severity of their AIHA disease process; this will be assessed by standard assays using sera from patients with SLE and anti-erythrocyte antibodies.	06/17/2019 – 06/16/2020	Dr. Neel Krishna	$50,000	$50,000
Responsible Robotics Corporation	*A Robotics Monitoring and Control Platform*	Responsible Robotics is a robot management and control software company that focuses on enabling companies in the utility and energy sector to scale their drone operations. For this project the team plans to implement a responsible routing service that would allow a single operator to operate multiple drones safely.	07/01/2019 – 12/31/2019	Mr. Christian Manasseh	$49,625	$57,440
Ryzing Technologies	*Braided Inflatable Robotic Technology (BIRT) for Dexterous Maritime Manipulation System (D2MS)*	Building on previous CRCF success with the Braided Inflatable Robotics Technology (BIRT), Ryzing Technologies seeks to use FY2019 funding to design and fabricate soft robotic components capable of interfacing with existing solutions in a way that they can be easily manufactured and available at a lower cost. The team will also work to identify key partnerships and leverage those relationships to identify common challenges that can be overcome by applying inflatable and textile expertise to autonomous systems.	06/17/2019 – 06/30/2020	Mr. Ryan Gundling	$49,953	$51,453

Award Recipient	Project Title	Project Description	Period of Performance	Principal Investigator	CRCF Award	Match
Sentinel Robotic Solutions, LLC	*Mobile Sentinel – Mobile Unmanned Automated Traffic Control Sensor and Gate System*	Mobile Sentinel is a revolutionary unmanned automated access control system designed for a significantly safer, more efficient, and cost effective alternative to vehicle and pedestrian control around hazard areas and work sites. CRCF funding will allow Sentinel Robotic Solutions to fully commercialize this product.	06/17/2019 – 01/31/2020	Mr. John Robinson	$25,000	$49,914
Status Identity, Inc.	*Continuous Authentication and Identification by Distinctive Characteristics*	Status Identity aims to develop a prototype for the application of behavioral biometrics to the multi-factor authentication process and hypothesizes that data gathered from mobile device sensors are sufficiently unique to each individual, such that they may be used for user authentication and access controls.	07/01/2019 – 02/28/2020	Mr. Nakul Munjal	$25,000	$50,000
Virongy LLC	*Commercialization of Infectin*	Virongy has developed a proprietary technology, Infectin, that can enhance viral infection and viral vector transduction of target cells. CRCF support is for the prototype development and commercialization of Infectin-II for its application in cancer CAR-T cell therapy.	06/17/2019 – 06/16/2020	Mr. Yuntao Wu	$48,791	$59,804
				TOTAL COMMERCIALIZATION PROGRAM AWARDS:	**$769,436**	
				TOTAL COMMERCIALIZATION PROGRAM MATCHING FUNDS:	**$2,060,291**	
MATCHING FUNDS PROGRAM						
Commonwealth Center for Advanced Manufacturing	*Additive Manufacturing of Metal Alloys for 3D Medical Devices*	The CCAM-VCU team will create 3D additively manufactured metal implant specimens with optimal mechanical properties to both withstand repetitive forces experienced in the body and to encourage bone ingrowth into the biomimetic implant surface with the goal of increasing implant retention in patients.	07/01/2019 – 06/30/2020	Dr. Barbara Boyan	$99,988	$107,944

Award Recipient	Project Title	Project Description	Period of Performance	Principal Investigator	CRCF Award	Match
Commonwealth Center for Advanced Manufacturing	*Advanced Analytics Framework for Deploying Automated Defect Detection in Manufacturing*	CCAM will create a novel approach for automated evaluation and validation of non-destructive evaluation processes using various big data inputs types, such as optical, infrared, and ultrasound. The program will produce a solution which will improve manufacturing quality and reduce costs to bring new NDE systems to market.	07/01/2019 – 06/30/2020	Dr. Huda Al-Ghaib	$98,166	$103,800
George Mason University	*Wearable Ultrasound System for Robust Sensing of Muscle Activation*	With the CRCF funding, the GMU team seeks to develop a novel sonomyography-based sensing system that facilitates object manipulation in a personalized, virtual, home-based rehabilitation environment and establish a company in VA for commercialization. The goal is to improve the quality of life of persons living with mobility impairments such as amputation and stroke.	06/17/2019 – 01/16/2021	Dr. Siddhartha Sikdar	$98,456	$98,456
Southeastern Universities Research Association	*Development of High-Resolution Radiotherapy Beam Characterization Technology Using Micropattern Gas Detection*	SURA seeks to develop a prototype device that significantly improves spatial resolution for radiation therapy treatment of cancer. Using a novel Gas Electron Multiplier (GEM) technology, the team expects to achieve exceptional spatial resolution that is much improved over the current clinical instrumentation.	08/01/2019 – 07/31/2020	Dr. Cynthia Keppel	$100,000	$109,265
University of Virginia	*Designer Enzymes as Green Alternatives to Protect High-Value Agricultural Products Pre- and Post-Harvest from Microbial Infection*	UVA seeks to develop new enzymes as organic, green replacements to chemical additives, preservatives, and fungicides used in the winemaking industry. The technology addresses the key, unmet need for a safe, green solution to improve wine quality and extend product shelf life and supports the growing VA wine industry.	07/01/2019 – 06/30/2020	Dr. Bryan Berger	$100,000	$100,000

Award Recipient	Project Title	Project Description	Period of Performance	Principal Investigator	CRCF Award	Match
University of Virginia	*VADstent to Prevent Cavity Collapse and Adverse Cardiac Remodeling*	UVA's team of cardiac surgeons and engineers has developed a novel stent to place inside the left ventricle of a patient's heart who is on a continuous flow ventricular assist device (VAD), which improves the VAD's function and helps the right side of the heart work for a longer amount of time. VAD's are currently the standard of care for advanced heart failure patients, as there are not enough suitable organs for transplant. CRCF funding will be used for large animal testing and FDA approval.	06/17/2019 – 06/30/2020	Dr. Mark Roeser	$54,578	$160,000
Virginia Commonwealth University	*Development of a Highly Efficient Air Filter for Inactivation of Airborne Germs*	The proposed project at VCU aims to develop an efficient antimicrobial air filter to kill airborne germs, such as bacteria, viruses, and fungi, to prevent infectious diseases in various indoor environments.	07/01/2019 – 06/30/2020	Dr. Weining Wang	$100,000	$100,000
Virginia Commonwealth University	*A Nanotechnology Approach for Streamlining Detection of Prognostic Translocations in Multiple Myeloma (MM)*	The goal of this VCU project is to use PRECYSE technology to streamline detection of the structural variant mutations that occur in multiple myeloma.	07/01/2019 – 06/30/2020	Dr. Jason Reed	$100,000	$100,000
Virginia Commonwealth University	*Rapid Cell Typing Technology for Forensic DNA Casework*	VCU seeks to validate a technology prototype for improving DNA profiling efforts within forensic caseworking labs.	06/24/2019 – 06/24/2020	Dr. Christopher Ehrhardt	$100,000	$100,000
Virginia Commonwealth University	*Sulfated Glycosaminoglycans as Disease Biomarkers and Molecular Targets for Precision Medicine in Cancer*	Approximately 50% of all cancer patients receive a platinum-based drug. By identifying glycosaminoglycans as a molecular target, this VCU project will identify new platinum drugs capable of overcoming resistance to the currently used agents and which will be especially useful in difficult-to-treat cancers such as triple-negative breast cancer and high-	06/17/2019 – 06/16/2020	Dr. Nicholas Farrell	$100,000	$100,000

Award Recipient	Project Title	Project Description	Period of Performance	Principal Investigator	CRCF Award	Match
		grade serous ovarian carcinoma; the results could be translated into the clinic – the first example of a precision medicine for platinums.				
Virginia Institute of Marine Science	*Leveraging Deep Lens Technology to Form a Video Inundation Monitoring System for StormSense*	CRCF funds will be used to continue development and commercialization of the StormSense-VIMS, an automated IoT web-camera sensor system capable of detecting anomalous water levels and interpreting the video/images into transmittable flood depth data in real time. Specifically, the project will focus on additional testing, developing a cleaner design for the sensor, and developing effective pricing models for the hardware and software.	07/01/2019 – 06/30/2021	Dr. Jon Derek Loftis	$49,612	$50,554
Virginia Tech	*Development of a Connected Smart Vest for Improved Roadside Work Zone Safety*	A Smart Vest product will be designed and developed for roadside workers. This flexible, wearable solution will be built based on IoT principles to connect workers with Connected and Automated Vehicles (CAVs) in order to accurately localize roadside workers and provide proactive warnings about imminent threats.	07/01/2019 – 06/30/2020	Dr. Nazila Roofigari-Esfahan	$91,069	$91,069
Virginia Tech	*Precision Medicine Exosomal Drug Delivery Medtech for Heart Attack*	Heart disease is the number one cause of sickness and death in VA and throughout the world. A team of leading scientists from Virginia Tech and UVA have developed a new therapy based on a novel discovery for drug delivery and, in this CRCF project, they will use this new exosomal technology to deliver a therapeutic peptide with potential to prevent loss of cardiac muscle following a heart attack.	06/17/2019 – 12/16/2020	Dr. Robert Gourdie	$100,000	$106,766

Award Recipient	Project Title	Project Description	Period of Performance	Principal Investigator	CRCF Award	Match
			TOTAL MATCHING FUNDS PROGRAM AWARDS:		**$1,191,869**	
			TOTAL MATCHING FUNDS PROGRAM MATCHING FUNDS:		**$1,327,854**	
SBIR MATCHING FUNDS PROGRAM **						
Alexander BioDiscoveries, LLC	*Small Molecule Inhibitors of the Influenza Virus Nucleoprotein for Drug Development*	Influenza is a continuing, worldwide, public health challenge that results in significant human and economic impact every year. The proposed project seeks to develop new antiviral drugs syntheses to combat the influenza virus, which causes influenza disease.	06/17/2019 – 12/16/2019	Dr. Cyrille Gineste	$50,000	$300,000
Covenant Therapeutics, LLC	*Drug Discovery for Gram-Negative Rod Bacterial Infection*	A drug discovery project targeting a new mechanism for treating Gram-negative rod bacterial infections is being explored by Covenant Therapeutics. Success could lead to new therapies that address a growing concern over the shrinking choices of effective treatments for the emergence of new multi-drug resistant bacteria.	07/01/2019 – 06/30/2020	Dr. Mikell Paige	$49,995	$224,669
Fend Incorporated	*Low-Cost Data Diodes for Physical Protection of Connected Infrastructure*	Fend provides energy and industrial equipment operators with a physical barrier to cyberattack through its low-cost, plug-and-play data diodes. Under this CRCF project, Fend's team will add on-board cellular connectivity to its hardware and enhance the predictive analytics capabilities of its cloud-based equipment monitoring service.	06/17/2019 – 12/17/2019	Mr. Colin Dunn	$50,000	$150,000
Gradient Consulting	*Achieving Eternal Flight with a Tethered Uni-Rotor Network (TURN) System*	Gradient Consulting is developing a novel UAS, called the Tethered Uni-Rotor Network (TURN), which combines the best features of helicopter and glider methodologies, and pairs hover and vertical takeoff and landing (VTOL) capabilities with a greatly extended flight endurance. The CRCF project will help	06/17/2019 – 09/09/2019	Dr. Justin Selfridge	$50,000	$146,991

Award Recipient	Project Title	Project Description	Period of Performance	Principal Investigator	CRCF Award	Match
		accelerate commercialization, by funding the construction of a starting inventory.				
ICBiome	*A Cloud-Based WGS Platform for Routine Surveillance of Hospital Pathogens*	Healthcare-associated infections (HAIs) are a significant public health burden. With CRCF funding, ICBiome plans to develop an interactive visual interface that showcases the effectiveness of using their cloud-based genomics platform to contain HAIs. The platform can be deployed by any large hospital to routinely track circulating lineages and implement targeted containment strategies, effectively improving the HAI statistics of the hospital.	06/17/2019 – 12/16/2019	Dr. Srini Iyer	$50,000	$223,688
JKM Technologies, LLC	*Local Footwear Manufacturing Using a Novel Cost-Effective Pellet-Based 3D Printing Process*	This CRCF project supplements an NSF grant for a special 3D printing process to make shoe soles, through the development of a specific shoe style using this process to be made locally in VA.	07/01/2019 – 06/30/2020	Dr. D. Casey Kerrigan	$50,000	$598,999
Micro Harmonics Corporation	*Commercialization of Cryogenic Millimeter-Wave Isolators*	Micro Harmonics Corporation will use CRCF funding in a highly focused effort to continue to bring the cryogenic isolators designed under a complementary SBIR award to the commercial market as well as to move fabrication of a key component of the isolators in-house in Fincastle, VA.	06/17/2019 – 12/17/2019	Ms. Diane Kees	$50,000	$124,699
NOVI LLC	*Next Generation, Intelligent, and Autonomous Satellites for an Emerging New Space Industry*	The proposed CRCF project builds on NOVI's Phase I SBIR with the Air Force, and aims to serve an emerging new space industry that is trying to replace large and expensive legacy satellites with constellations of smaller, lower-cost, and easily refreshable hardware solutions. Specific activities will include fit checks of a 12U satellite mockup, experimental	06/17/2019 – 12/16/2019	Dr. Amit Mehra	$48,700	$149,630

Award Recipient	Project Title	Project Description	Period of Performance	Principal Investigator	CRCF Award	Match
		verification of key component performance, and initiation of payload integration activities with prospective customers.				
SeeHear LLC	*Commercialization of an NIH- and NSF-Supported Web-Based Speech Perception Training System for Adults with Hearing Loss*	Older adults suffer from reduced ability to cope with noise, often leading them to withdraw from social interactions, with known negative consequences such as cognitive decline. SeeHear LLC will complete a necessary commercialization step for a web-based speech perception training system that will be used by adults with hearing loss to improve their abilities to combine visual and auditory speech information, and thereby increase their ability to converse in noisy social settings.	07/01/2019 – 06/30/2020	Dr. Silvio Eberhardt	$50,000	$150,746
VoltMed Inc.	*Testing of an MRI-Compatible Electrode for Treating Brain Tumors with Non-Thermal Ablation*	The CRCF award to VoltMed will be used to support: submission of a patent application used to protect electrode design for H-FIRE treatment, electrode biocompatibility testing required for IDE submission, testing the electrode ex vivo and mapping the sub-lethal heating in the brain, and an internship opportunity for creating a numerical model of brain electroporation in humans that will contribute to the submission of an investigation device exemption to the FDA.	06/17/2019 – 12/16/2019	Dr. Chris Arena	$50,000	$244,498
WynnVision LLC	*Antimicrobial and Biocompatible Endotracheal Tubes*	Ventilator-associated pneumonia (VAP) occurs 48-72+ hours following endotracheal intubation and accounts for about half of all cases of hospital-acquired pneumonia. WynnVision LLC aims to develop a new approach to greatly reduce	07/01/2019 – 06/30/2020	Dr. Kenneth Wynne	$50,000	$225,000

Award Recipient	Project Title	Project Description	Period of Performance	Principal Investigator	CRCF Award	Match
		the incidence of VAP and ventilator-related infections.				
				TOTAL SBIR MATCHING FUNDS PROGRAM AWARDS:	**$548,695**	
				TOTAL SBIR MATCHING FUNDS PROGRAM MATCHING FUNDS:	**$2,538,920**	
				TOTAL CRCF FY2019 AWARDS:	**$2,510,000**	
				TOTAL CRCF FY2019 MATCHING FUNDS:	**$5,927,065**	

FY2019 Funding Totals

PROGRAM	FY2019 AWARD COUNT	FY2019 AWARD TOTAL	FY2019 MATCH TOTAL
Commercialization Program	17	$769,436	$2,060,291
Eminent Researcher Recruitment Program	0	$0	$0
Matching Funds Program	13	$1,191,869	$1,327,854
SBIR Matching Funds Program	11	$548,695	$2,538,920
STTR Matching Funds Program	0	$0	$0
ALL PROGRAMS	**41**	**$2,510,000**	**$5,927,065**

* Indicates declined award; figures in Appendix A *include* the declined awards

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

APPENDIX B: RTIAC Members

In FY2019, 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.

- **Steve Clinton,** former Vice President and COO – Sebesta, Inc. (*retired*)
- **Morris Foster**, Vice President for Research – Old Dominion University
- **Cheryl Giggetts,** Principal Consultant – CTA Consultants, LLC
- **Keith Holland,** Interim 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
- **Srirama Rao**[5], Vice President for Research and Innovation – Virginia Commonwealth University
- **Venkat Rao,** Director, Chem-Bio Programs – Parsons
- **Scott Tolleson,** Managing Director – NRV

[5] Srirama Rao replaced Frank Macrina in October 2018; his role on the RTIAC is by virtue of the position.