CCALS Commonwealth Center for Advanced Logistics Systems

December 30, 2021

The Honorable R. Brian Ball
Secretary of Commerce and Trade
Commonwealth of Virginia
Patrick Henry Building
1111 East Broad Street
Richmond, Virginia 23219

The Honorable Luke E. Torian
Chair, House Appropriations Committee
Virginia House of Delegates
Pocahontas Building
900 E. Main Street
Richmond, Virginia 23219

The Honorable Janet D. Howell
Chair, Finance and Appropriations Committee
Senate of Virginia
Pocahontas Building
900 E. Main Street
Richmond, Virginia 23219

Daniel Timberlake
Director, Virginia Department of Planning and Budget
1111 East Broad Street
Room 5040
Richmond, Virginia 23219-1922

Virginia Innovation Partnership Authority
Robert Stolle
Center for Innovative Technology
Gather
313 East Broad Street
Richmond, Virginia 23219

**Commonwealth Center for Advanced Logistics Systems ("CCALS")**

Lady and Gentlemen:

Respectfully submitted is the full and complete report with audited figures of CCALS required by Section N.2. of Item 135#1c of the 2020 Session Budget Amendment HB30 (Conference Report). This replaces the partial report with unaudited figures filed September 28. The CCALS 2020 audit as of the October 1 reporting deadline was not complete.

Sincerely,

Mark C. Manasco
President

cc w/enclosure: Dr. Dawit Haile
Chair, CCALS

# Commonwealth Center for Advanced Logistics Systems (CCALS)

# Report of Unaudited Revenues, Funding Sources, Research Activities and Relevant Economic Outcomes

# For Calendar Year 2020

## I. VIPA HB30 Legislative Background

*CCALS shall submit a report by October 1st of each year to the Secretary of Commerce and Trade, the Chairs of the House Appropriations and Senate Finance and Appropriations Committees, the Director of the Department of Planning and Budget, and VIPA to include (i) all planned and actual revenue and expenditures along with funding sources, including state, federal, and other revenue sources for CCALS, (ii) the research activities of CCALS, and (iii) relevant economic outcomes as a result of the CCALS' work in each fiscal year.*

## II. Revenue and Funding Sources as of December 31, 2020

| | | | | | |
|---|---|---|---|---|---|
| Commonwealth Center for Advanced Logistics Systems | | | | | |
| Audited Revenue (Funding Sources) and Functional Expenses | | | | | |
| December 31, 2020 | | | | | |
| | | | | | |
| | | | | | |
| Revenue and Support | | | | | |
| Federal | | | | | |
| State | | | | $ | 3,000.00 |
| Other | | | | | |
| Port of Virginia (NIG) | | | | | 50,000.00 |
| CIT | | | | | 175,000.00 |
| Deferred Revenue from 2019 | | | | | 95,149.00 |
| In-Kind Revenue | | | | | 3,600.00 |
| Discount on Startup loans | | | | | 5,427.00 |
| Total Revenue and Support | | | | $ | 332,176.00 |
| | | | | | |
| Operating Expenses | | | | | |
| Program Services | | | | | 259,568.00 |
| Management and General | | | | | 118,713.00 |
| Research Development | | | | | 117,290.00 |
| Total Operating Expenses | | | | | |
| | | | | | |
| Increase in Net assets without donor restrictions | | | | | 495,571.00 |

## III. CCALS 2020 Research Activities and Relevant Economic Outcomes

1) **Sixth Year of CCALS and Port of Virginia Research Partnership**

   a. CCALS is in the sixth year of an ongoing research relationship with the Port of Virginia. CCALS conducts analysis of intermodal ecosystems and data sharing opportunities with the Virginia Department of Transportation, strategic plans, emergent conditions, port operations, logistics systems design and capital improvements.
   b. The POV is indirectly responsible for 1 in 10 jobs in the Commonwealth according to recent economic reports. A key performance indicator of POV is the turn time or how quickly they can unload and then reload a container for transportation outside the terminal gates. The industry standard is 60 minutes. CCALS first contribution was data analytics and options for improving turn times. POV now operates at 35 minutes for traditional turn time and 39 minutes for expanded turn time significantly below the industry standard of 60 minutes in 2020 making it one of the most efficiently run ports on the east coast.

2) **Improving Transaction Processing and Information Systems for Tool Control: Ideal Components of Tool Asset Control and Management Systems for the Virginia Department of Corrections**

   a. The VADOC is a model correctional agency and a proven innovative leader in the profession. An automated, enterprise-sized, asset management solution is needed to improve the efficiency and the effectiveness of our asset management responsibilities throughout the VADOC. The safety and security of the VADOC facility staff and offenders is a top priority; therefore we intend to implement an automated tool control component as the first phase of an enterprise-wide asset management system.
   b. There are 43 prison facilities, 60 community correctional offices/facilities and 3 regional administrative offices. The VADOC employs around 13K staff and is responsible for the care and custody of 90K offenders. The annual operating budget is in excess of 1 billion dollars. CCALS is supporting development of a request for proposals for a next generation of a tool control and inventory system to be pilot-tested and deployed across Virginia prisons. The VADOC is among the first in the nation to explore these augmented/automated manual systems for tool control. The innovation and scale of this will benefit from a systems approach that incorporates flexibility and evolution of system concepts to “learn as you go”. As well, the emergent and future conditions that could be disruptive to system acquisition should be tracked in a risk register.
   c. A technology solution offers VADOC significant gains in efficiency (time and cost savings) and effectiveness (real-time data) to enhance accountability for tools. Further, a systems perspective offers future benefits in extending technology to control and inventory weapons, security equipment, supplies and consumables with the same efficiency and effective outcomes.

**3) Virginia Transportation Research Council (VTRC)**

a. CCALS is consulting on a VDOT project with UVA for Data Analytics and Resilience of Transportation Plans with Emergent and Future Conditions. This is Phase 4 of a 5-year technical assistance effort ending in 2025. This effort continues to develop and enhance various methods of data analytics that support transportation planning, performance measurement, trends analysis, project prioritization, travel demand modeling, corridor studies, investment evaluation, corridor management, and data sharing platform.
b. The results will support resilience of transportation plans in terms of policy, business processes, practices, methods, and tools.

**4) Collaborative Research with National Science Foundation (NSF) - Center for Hardware & Embedded Systems Security & Trust (CHEST)**

a. CCALS transforms advanced logistics systems for market-ready solutions. Its robust network provides value through metrics-based problem solving for today's real-world challenges. One of the challenges for advanced logistics systems is security and trust for cyber security and IoT. That is why CCALS is one of the original industry members of the NSF sponsored Center for Hardware and Embedded Systems Security and Trust (CHEST) through the University of Virginia (UVA) site.
b. CHEST is the largest NSF IUCRC and our go-to center for researching and developing security, assurance, and trust strategies to meet Virginia's commercial economic needs for supply chains. CHEST coordinates university-based research with needs of industry and government partners to advance knowledge of security, assurance, and trust for electronic hardware and embedded systems. We will achieve natural growth by continuously providing high quality security, assurance, and trust strategies for cyber-physical systems and the IoT. CHEST research has informed discussions with COVID-19 Virginia Department of Emergency Management on vaccine supply as well as work with the Virginia Department of Corrections and the Port of Virginia.

c. The CHEST Industry Advisory Board (IAB) approved 2020 year 1 funding for three CCALS supported research projects. Project 3_20 is for a reverse engineering methodology for field programmable gate array (FPGA) bit-streams for trojan circuits in 3$^{rd}$ party IP. Project 5_20 addresses cost-effective resource allocation to portfolios of security measures for embedded devices in a large-scale system (counterfeit electronics). Project 6_20 focuses on trusted enterprise communications and cyber-physical Integration of advanced fleet electrical vehicle chargers in a mobile electric grid.

**5) U.S. Army Corps of Engineers (USACE) Engineering Research and Development Center (ERDC)**

a. CCALS is consulting on a 5-year UVA project with the USACE for modeling and data analysis to improve resilience of complex systems that are in the purview of the US Army Corps of Engineers. This fundamental research (National Security Defense Directive 189) will be performed by the University of Virginia with recognition of the needs of current missions of the ERDC-USACE.
b. The key deliverables are reports, software, databases, demonstrations, and technology transfer in the form of peer-reviewed publications. The expected results will extend the capabilities of the USACE-ERDC in network science, resilience and scenario analysis, cyber-physical systems resilience, supply-chain resilience, resilience metrics and quantification, social and psychological factors, and automation of tools for resilience analysis. The proposed effort will develop and demonstrate methods, metrics, and databases.

**6) Development of Secure Compartmentalized Automated Refrigerated Storage (SeCARS) for Controlled Medicines -CRCF Project MF18-011_LS**

a. The secure storage and control of access to medicines is an important component of modern hospital pharmacy practice. Examples of medicines which must have controlled access include opiates (e.g. Vicodin, Fentanyl) as well as other common treatments such as insulin. The existing marketed technology has several deficiencies, the most important of which is that the commercial room-temperature storage systems lack the analogous capability for secure and controlled storage of refrigerated medicines in individual compartments. In order to address these deficiencies and take advantage of a significant market opportunity the development of a Secure, Compartmentalized, Automated, Refrigerated Storage (Scars) system has been designed and a provisional patent has been filed.
b. In addition to the qualitative value of appropriate storage of controlled medicines, it is possible to demonstrate the monetary value of the proposed SeCARS unit using a single specific example of cisatricurium. Last year, 50% of the cisatricurium expired unused due in part to lack of refrigerated secure storage with a conservative value of $70,000. This is only one example out of hundreds of related refrigerated medicines at VCU with a total waste value of over $3M.
c. The CIT CRCF funding is intended to prepare the SeCARS for licensing and commercialization by i) the use of CCALS supply chain expertise to determine the value of SeCARS across the entire VCU system and extend that to valuation in other large hospital systems and ii) to develop a fully functional prototype to confirm operating parameters and demonstrate to potential customers.

**7) Addressing the Logistical Challenge of Medication Reconciliation in Emergency Medicine Settings – CRCF project MF18-012-LS**

a. Knowledge of a patient's current medication is of extreme importance for physicians and surgeons in emergency medicine setting. A majority of patients admitted to hospitals for trauma or emergency medicine are older adults on 3-7 prescription medications. Increasing frailty with age results in most of those patients being either unconscious, unable to think clearly or not knowing their current medications at the time of hospitalization. This forces the hospital to obtain this information using other sources (calling pharmacies, primary care providers, next of kin etc.) that are not reliable, time consuming and prevents timely interventions to affect clinical outcome. All attempts using electronic records to track medication have failed so far. Considering the 130 million annual ER visits in the US and the greater than 1500 FDA approved drugs on the market, identifying a patient's current medication using existing methods in a timely manner is a major logistical challenge.
b. The research proposes the use of a mass spectrometry-based approach to directly identify medications in a patient's blood stream as a novel approach towards addressing this logistical challenge. We have now demonstrated feasibility by accurately detecting novel oral anticoagulants in the blood of 350 elderly trauma patients. Currently we are expanding the list of medications to a total of 50 and are in very early stages of forming a company to take the product to market. However, considering the large number of FDA approved medications, we need to expand the list of medications covered to at least the top 100 most common medications for this method to be broadly applied. The CIT CRCF funding achieves the goal of transitioning the work into a commercial entity and to increase the product value for better marketability.

**8) VSU and UVA MS/PhD Cohort 2020.**

**a.** As part of the continuing CCALS Diversity, Equity, and Inclusion (DEI) effort, three VSU undergraduate students are pursuing a fully funded (tuition, medical insurance and stipend) graduate degree at UVA School of Engineering and Applied Science (SEAS).
**b.** Two students are pursuing a graduate degree in systems engineering and one student is in the civil engineering degree program.

**9) Crater Planning District Commission (CPDC) EDA CARES Act Recovery Assistance Grant**

**a.** CCALS is conducting an economic recovery and resilience analysis on supply chain disruptions in the region's logistic sectors in response to the coronavirus pandemic. Analysis of the long term and short-term forces affecting regional supply chains with emphasis on the logistics-based businesses including the Distribution, Warehousing and Transportation sectors. It will include analysis of year over year business activity at the Port of Virginia as well as the Port of Richmond because of the COVID -19 environment. The analysis will identify and quantity the potential risk of supply chain disruption, higher risk of uncertainty about supply disruption

owing to fragmentation of global supply, outsourcing, off shoring, materials management, and Covid-19 environment.