Status Update

October 1, 2023

CONTENTS

CCAM STATUS UPDATE

This update is being submitted as required by HB30 (Chapter 2), Item 127, K.5.:

> K.5. "CCAM shall submit a report on October 1 of each year to the Secretary of Finance, Chairs of the House Appropriations and Senate Finance and Appropriations Committees, and VIPA containing a status update of all new incentive programs, including but not limited to the following: (i) MOUs it has entered into with each university partner; (ii) funds disbursed to both university and private sector partners of CCAM, as well as any other recipients; (iii) any other agreements CCAM has entered into with representatives of the public and private sectors that may impact current and future incentive fund disbursements; (iv) all efforts and costs associated with obtaining federal research grants; and (v) any additional information requested by the Secretary of Finance, or the Chairs of the House Appropriations and Senate Finance and Appropriations Committees."

Elements requested in K.5. are outlined on page 29. In addition to those items requested, a brief overview is provided below to communicate CCAM's progress over the past year.

Executive Summary

Financial Update

- With the support from the Commonwealth, CCAM continues to make progress in the execution of its growth plan for long term sustainability.
- CCAM is in the process of completing its annual audit for Fiscal Year 2023. Final audit results are expected later this year with an expected designation of an unqualified opinion. Audited financial statements for FY 2023 can be provided once received by CCAM.
- [redacted]

  [redacted] all trade debt is current as of September 29, 2023.
- Legislative actions were put in place for DGS to acquire the CCAM property (HB1800 Chapter 552, approved April 7, 2021), however the transaction has not been finalized as of September 29, 2023. DGS is working with CCAM, CCALS, UVA Foundation (UVAF), and the U.S. Economic Development Association (EDA) to facilitate use of bond proceeds of the Virginia Public Building Authority for the acquisition. [redacted]
- While CCAM awaits finalization of the building acquisition, preparation for co-location of the Commonwealth Center for Advanced Logistics Systems (CCALS) at the CCAM building has been on hold. Once the acquisition has been completed, CCAM has been directed by DGS to cover an estimated [redacted] in Tenant Improvement "TI" expenses to benefit CCALS.

CCAM Economic Impact

- CCAM contracted Chmura Economics & Analytics Group to develop an objective assessment of CCAM's impact on the economy of the Commonwealth. Chmura's analysis concluded:
    - **each dollar of state funding generating $17.3 in economic activity within the Commonwealth**.
    - **CCAM's total cumulative impact** (direct, indirect, and induced) has **reached $229.1 million and supported 1,259 jobs in the state**. This equates to $19.1 million and 105 jobs, annually.
    - These impact estimates exclude the impact from Rolls-Royce operations (part of business attraction impact), which closed their operations in Prince George County in 2021.

Business Development

- CCAM is utilizing the data and recommendations from the 2022 Chmura Report to build on our strengths and better understand how we can support the growth of the manufacturing base in Virginia, keying in on priority industries like advanced pharmaceutical manufacturing.
- Additionally, CCAM has engaged with specialists from GENEDGE to conduct best-in-class benchmarking of the CCAM Membership model. Currently underway, this activity has:
    - holistically examined our membership model to better understand our value proposition from both absolute and relative perspectives,
    - gathered significant Voice of the Customer data and benchmarking information to understand how we are perceived today and inform how to best serve our stakeholders going forward.
- As a result of this work, CCAM is currently finalizing a new membership structure that includes elements identified as both needs from the manufacturing community and differentiators in the marketplace.
- It is expected that these changes will make CCAM more attractive with membership features that complement our technology development and validation. Some of these are already being deployed with current members.
- The goals of the new model include being simpler to navigate and offering much lower barriers to entry for small and medium-sized companies, particularly those with operations in Virginia.

Federal Funding: Federal funding momentum continues with significant future impact

- Commonwealth support has accelerated CCAM's engagement in attracting federally funded programs.
- CCAM continues to make progress in securing new federal grants: new award amounts increased YOY to $1.3M.
- Revenue from (i.e., CCAM expenditures against) these federal grants has increased YOY by 122% in FY23 to $1.1M. In FY24, we project to again see a YOY increase.
- The pipeline of CCAM campaigns and proposals showed continued strength, with conservative probability weighted awards estimated at $3-4M in the near term.
- CCAM has become a leading partner in major collaborative initiatives, including supporting the regional pharmaceutical cluster in the Alliance for Building Better Medicines, NSF Regional Engine, and addressing critical submarine supply chain risks for the US Navy.

- CCAM has a major role in defining new technology pipelines and digital strategies for the US Navy's AM Pro/Subs program. CCAM current award levels for this program are ~ $1M and future (near term) awards are expected on the order of $2-5M.

Workforce Development: CCAM now a holistic partner for developing a talent pipeline

- The Central Virginia Chapter of the **Federation of Advanced Manufacturing Education (FAME)** has expanded its impact on manufacturing companies in the region, with **a total of sixteen companies** now participating as Core Members. The first cohort of students who entered the program in 2021 have now graduated, and **all were offered full-time employment** by their sponsoring companies.
- With **CCAM now identified as the In-Region Coordinating Entity for GO TEC** (short for Great Opportunities in Technology and Engineering Careers) in Central Virginia, we have secured GO Virginia grant approval and will deploy GO TEC Career Connections labs in five area middle schools by the beginning of the 2024-2025 School Year. The proven success model of GO TEC will help spark students' interest to pursue STEM careers.
- CCAM continued to grow and refine its internship program for engineering students and was again recognized by Virginia's Talent + Opportunity Partnership as a **2023 "Top Employer for Interns"**.
- **CCAM is developing and deploying a structured Talent Incubator model** available to all CCAM members. Customizable to meet companies' needs, this approach will strengthen engineering students' technology skills in critical and emerging areas, like Industry 4.0 and AI, to **make them "job-ready" when they graduate**.
- **CCAM is working with its university partners to make this happen**. Starting with VSU, CCAM is developing laboratory-based course content that augments the learning for undergraduate students. **Current CCAM member companies are already utilizing elements of this program to upskill their incumbent technical teams**.

Operational Risks

- **Staffing** – CCAM has taken positive steps to be able to successfully compete in a very competitive labor market and has performed well in FY23, though the risk of staff attrition remains. This presents two key risks: a) delayed execution resulting in decreased revenue and increased research liability, and b) potential resource constraints with an anticipated ramp up in Federal program activity. CCAM continues to balance the need to prepare staffing levels for any anticipated federal award wins against the consequences of hiring too early.
- **Recessionary** – The threat of a potential recession remains and is likely to have an effect on corporate spending on research and development in FY24/5. For CCAM, this could put pressure on existing membership status, slow new industry memberships, and reduce additional spend by existing members above their annual member fees. Some prospective members have delayed engagement until 2025 as they are wary of an impending economic slowdown. CCAM's efforts to diversify its revenue sources via Federal program growth is a valuable lever to offset a potential decline in spending in the industrial sector. CCAM is also assessing its tiered membership levels among other best-in-class research organizations to align with the needs of the changing market.
- **Federal Program Growth** – Submission of a single federal award proposal is a probability weighted activity which could result in zero dollars awarded. To mitigate this risk, CCAM continues to diligently grow its pipeline of business and proposal development activities which should provide greater odds of overall return, including working with our US House and Senate representatives in the pursuit of Congressional funding. While we have tried to remain conservative on our probability projections,

there are a few large awards in our pipeline which are binary in terms of win/loss. This could result in a large fluctuation in what CCAM actually receives in terms of awarded contract value and could be exacerbated by the following risk:

- **Federal Government Shutdown** – An extended government shutdown without a continuing resolution in place looms large. Current projections include > 15% of revenues from the federal government. An extended shutdown will be a significant roadblock. This could affect FY24 revenues as well as delay potential new program wins. Leadership is currently outlining management strategies to offset this risk.

Overview

CCAM continues executing a long-term strategy focused on delivering increased value to the Commonwealth and our member companies. In FY2023, key strategic areas for CCAM included larger efforts in developing talent for Virginia's manufacturers, increasing industry and federal research, and assuming an increased leadership role in pursuing strategic initiatives for the Commonwealth and its growing manufacturing base. Notably, CCAM has increased R&D revenues by 13%, including growing our federally funded R&D by $600k YoY to $1.1M, led efforts in STEM education programs, adding to our FAME manufacturing technician program and our VA TOP award-winning internship program, and actively collaborating to drive regional economic development in the Pharmaceutical Advanced Manufacturing space.

Operational performance has improved despite significant market challenges. State funds provided to CCAM to develop a program for pursuing Federal funds has gained momentum, increasing CCAM's awards 2.9X since 2021, from $505K to $1.465M. Commonwealth support has enabled CCAM to strengthen partnerships with several Commonwealth agencies, the higher educational system and industry to drive economic development in the region. CCAM is a core team member of the Alliance for Building Better Medicine (ABBM) - winner of the national Build Back Better (BBB) Regional Challenge that brought $53M of federal dollars to the Richmond-Petersburg area. As an active team member, CCAM continues to support the regional strategy and the pharma community. CCAM is active on the BBB supply chain project, has representation on the ABBM Board, governance, infrastructure and workforce committees, has been awarded a related workforce development grant, and is the lead applicant on the Pharma-based EDA Regional Hub proposal. Through these and other activities, CCAM is helping to drive success for the cluster.

The Economic Impact of CCAM in Virginia

CCAM is an important enabler for the success of regional, national, and global manufacturing businesses. To help articulate its value to stakeholders, CCAM engaged Chmura Economics & Analytics (Chmura) in late 2022 to evaluate the economic impact of CCAM programs and activities in Virginia[1]from the following perspectives:

1. Research and Development (R&D) operations conducted by CCAM, including in-kind equipment and software donations received from industry members.
2. Business attraction activities enabled or catalyzed by CCAM.
3. Programs led by CCAM to support advanced manufacturing education.
4. Leveraged funding unlocked by CCAM.

Cumulatively, CCAM has received $13.3 million of funding from the Commonwealth of Virginia.[2] Chmura's analysis concluded that the impact from this funding was significantly larger, with **each dollar of state funding generating $17.3 in economic activity within the Commonwealth.**[3] Figure 1 summarizes CCAM's impact in Virginia. Chmura estimated that, from its inception in 2011 through 2022, the CCAM's total cumulative impact (direct, indirect, and induced) has reached $229.1 million and supported 1,259 jobs in the state (See Table 1). On an average annual basis, this equates to $19.1 million and 105 jobs. These impact estimates **exclude** the impact from Rolls-Royce operations (part of business attraction impact), which closed their operations in Prince George County in 2021.[4]

In FY2023, CCAM revenues increased by $1.0M to $8.6M (See Figure 2). Simple linear scaling over FY2022 ($1.0M = ~13.15% increase) implies $24.5M in economic impact and support for >118 high-paying jobs for FY2023.

[1] Chmura provides economic software, consulting, and data to their clients that help them make informed decisions to benefit their communities. Chmura's PhD economists, data scientists, and strategic planners guide clients through their local labor market. Over the past 24 years, Chmura has served hundreds of clients nationwide with thoroughness, accuracy, and objectivity.

[2] This amount is the sum of the state funding portion of CCAM revenue and excludes external and member funds.

[3] This estimate excludes impact from Rolls-Royce.

[4] If the impact from Rolls-Royce is included, from 2011 to 2022, the total cumulative impact (direct, indirect, and induced) of CCAM has reached $3.1 billion. On an annual average basis, it is estimated that CCAM has generated $260.9 million in impact (direct, indirect, and induced) in Virginia, supporting 1,017 jobs in the state per year from 2011 to 2022.

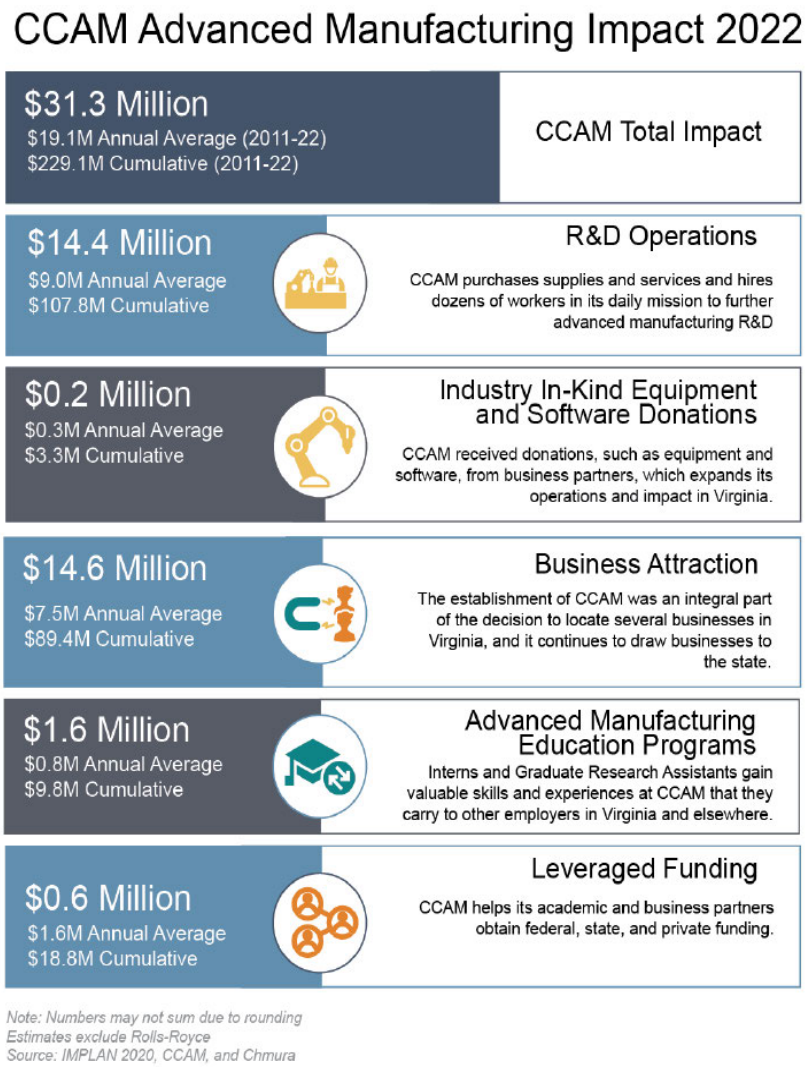

Figure 1: Overview Graphic on the Economic Impact of CCAM.

Overall, CCAM received very positive feedback from industry members regarding R&D outcomes, collaboration, and helping them to partner with higher education institutions. Samples of the comments from Chmura's research are listed below:

> *"Typically, CCAM is a catalyst for change in our manufacturing processes. Even if CCAM isn't part of the team that develops the final solution, the related project that we complete with CCAM often gets us to think differently about our operation."*

> *"US manufacturing industry needs the availability of technical research facilities like CCAM to innovate and become productive in world markets. CCAM is an excellent resource for research and its application in the manufacturing industry. CCAM's partnership adds value for companies developing new high-tech products and for manufacturers looking to enhance production methods."*

"Of similar research facilities across the country, CCAM is my preferred partner. Their industry and university access is very good and the mature process for handing intellectual property allows research projects to run smoothly. CCAM is leading the other research institutes in the ability and resources to conduct research independently." [5]

Table 2: Total CCAM Economic Impact Averaged $19.1M Per Anum in Virginia from 2011 through 2022.

		Direct	Indirect	Induced	Total Impact
Cumulative (2011-22)	Spending (Million)	$134.0	$54.5	$40.5	$229.1
	Employment	597	289	373	1,259
Annual Average (2011-22)	Spending (Million)	$11.2	$4.5	$3.4	$19.1
	Employment	50	24	31	105
Annual (2022)	Spending (Million)	$18.7	$7.4	$5.2	$31.3
	Employment	68	35	44	148

Note: Numbers may not sum due to rounding

Source: IMPLAN 2020, CCAM, and Chmura

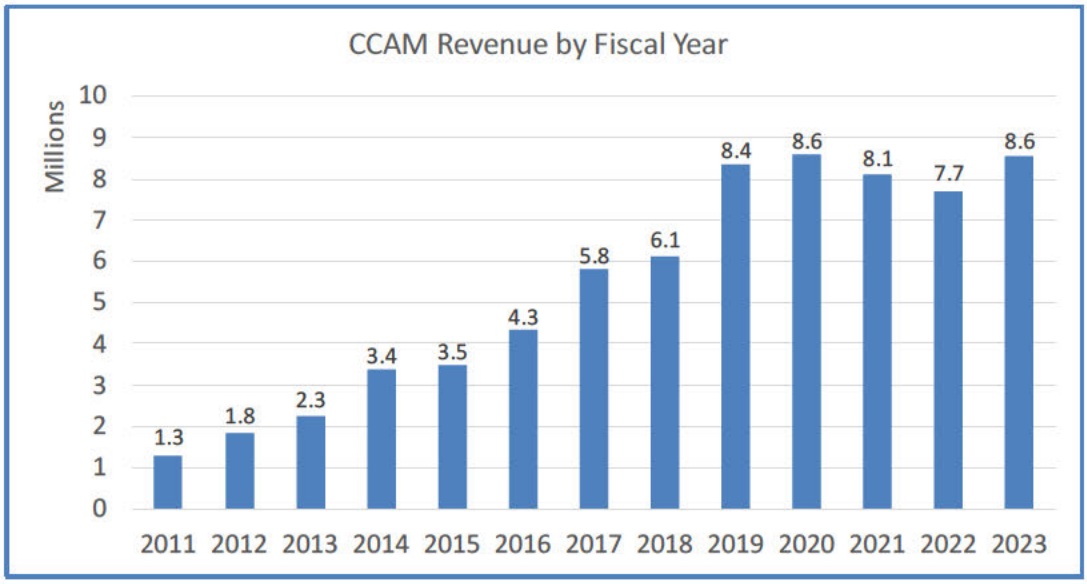

Figure 4: CCAM Annual Revenue Since Inception.

[5] For confidentiality, all quotes excluded any language that could be used to identify responders.

Strategy and Execution

Strategic Goals

CCAM continues to make positive progress against previously reported strategic goals, which can be categorized in three areas of Business Development, Enhanced Collaboration, and Workforce Development. Each of these three key areas contribute to an overall vision of increased economic impact for the Commonwealth and is described in more detail in subsequent sections of this report:

Business Development

- *Diversify the industrial membership base*. COVID-19 revealed the risk in relying solely on a single industry vertical membership base. Aerospace was hit particularly hard by the pandemic resulting in declining revenue. Industry revenue for CCAM has begun to increase again. Our assessment of best-in-class organizations provides a framework for revamping the CCAM membership model to stay up-to-date with market changes.
- *Overhaul the approach towards attracting federal funding.* Though correctly identified as a key element to CCAM sustainability, the execution plan was sub-optimal. This resulted in federal funding revenues that were an order of magnitude lower than projected. Positive strides have been made in developing a pipeline that should continue to grow federal revenue.
- *Focus CCAM strategy on the digital thread* concepts that allows CCAM to execute (1) and (2), above, while remaining focused on a core technology stack. This strategy allows CCAM to execute programs utilizing their core intelligent factory expertise for a diverse set of industries.

Collaboration:

- *Drive programs for Economic Development in the Region and the Commonwealth.* The CCAM team has engaged significantly in helping to drive the Advanced Pharmaceutical manufacturing Cluster as an opportunity to increase the organization's economic impact.
- *Enhance CCAM's Industry collaboration with Universities and Virginia government organizations*. CCAM is increasing opportunities for organizations to come together and collaborate through events, workshops, and programs.

Workforce Development:

- *Increase Focus on Workforce Development and Education*, which the Commonwealth has identified as a critical need. CCAM has enhanced our workforce programs in a way that compliments – rather than competes with – other workforce development efforts in the Commonwealth.

CCAM development in each of these focus areas has merit that stands on its own. However, together these advancements have a multiplicative effect in enhancing the regional manufacturing ecosystem while increasing the economic impact of CCAM for the Commonwealth.

Business Development

Overview

As CCAM considers opportunities for growth, we have used the data and recommendations from the 2022 Chmura Report to look holistically at the value proposition that our organization brings to the Commonwealth. The governor's economic priorities include aggressive pursuit of high-paying manufacturing jobs, with a specific focus on growth in our immediate vicinity. Our relationships with the state and regional economic development organizations and manufacturers have allowed us to be featured in ways that demonstrate the pull from manufacturing companies for our capabilities. While encouraging see the positive economic impact to the Commonwealth in the first ten years of existence, CCAM can still play a bigger and more important role to support the growth and sustainment of a vibrant manufacturing sector in Virginia.

The recent pandemic created new challenges or amplified existing ones for the manufacturing sector. In addition to the pull to develop technologies, supply chain and workforce issues have become top-tier priorities. In a highly integrated economy, these challenges do not exist in silos, but are instead closely connected to each other. CCAM's work over the past year – and moving forward is enabling us to support the manufacturing sector from this integrated perspective.

Of course, CCAM continues to expand its technical capabilities in manufacturing process development and validation, and to tie technical advancements together with its digital factory and Industry 4.0 capabilities. What's new is that these capabilities are now being matched with the ability to robustly move technical data across a complex supply chain and ensure that a company's technical workforce is ready with the skills they need to succeed.

Re-Thinking and Re-Tooling the CCAM Membership Model

As CCAM has considered the challenges of attracting and retaining member companies from industry, it has become apparent that several aspects of our membership model need to be refreshed to reflect current market realities:

1. The economics of R&D have clearly changed since CCAM's inception. Overall, companies have reduced their R&D investment as a percentage of gross revenue. Intense scrutiny of R&D budgets has led to increased competition and long-term commitments to a large, standing program of research are unusual. Many marquis-level companies are indeed pulling back on the number of organizations with whom they partner, making the climate for identifying new members very challenging.
2. The 'Escrow' approach to budgets has proven challenging. Many companies – particularly larger manufacturers are continually working to better match revenues and expenses within their various businesses. When CCAM was founded, our larger industry members would have a central R&D or

engineering organization that would pay the membership annual cost of from their budget, and distributed operating units would reap the benefits as projects were completed on their behalf. Today, those large, centralized budget pools have evaporated, and operating divisions within large companies are being forced to evaluate (and pay for) the work they want done on a business case basis.

3. CCAM has recognized that local / regional relationships (in VA especially) have great potential value and the opportunity to both be more productive and have a multiplier effect on Virginia's economy. At the same time, we realize that our network of connections and even awareness within the Commonwealth can be strengthened.

To objectively assess our approach and make improvement recommendations, CCAM engaged with specialists from GENEDGE to conduct a thorough analysis and benchmarking of members, stakeholders, and peer / competitor organizations. Via a process that has spanned several months, we have obtained valuable data and insights that are helping us to re-shape CCAM's Value Proposition in a way that should be significantly more inclusive and attractive for companies both in and beyond Virginia.

The research conducted by the GENEDGE team led to some important realizations. Some aspects of how CCAM is designed are greatly valued by manufacturers. Notable among these is CCAM's intellectual property model, which ensures that all intellectual property amassed under Directed Research projects will remain the sole property of the member or members sponsoring that work. Among the noted disadvantages, the current model is less accessible to small and medium-sized manufacturers, since the current membership levels require a significant cash outlay up front to establish an "on account" balance to then conduct research projects. CCAM also needs to do more to support Virginia-based manufacturers to strengthen our region's economy. It can also do more to share the expertise of our powerful research team to help build stronger member companies.

CCAM recognizes the value in simplicity, and as part of our motto of *Transforming Manufacturing Together*, we are taking the opportunity of re-shaping our membership model to incorporate as many of the GENEDGE recommendations as possible. The specific aspects of the model are currently being evaluated and modeled to confirm their viability and to understand how they will impact CCAM overall. Several key attributes under evaluation include:

- Significant lowering of the threshold costs for annual membership dues to enable access for small and medium-sized manufacturers.
- Consolidation of the research membership levels from 3 to 2.
- Elimination of the "Escrow Model" of advance payment to put funds on account and migrate to more of a "pay-as-you-go" model.
- Establishment of a "Talent Incubator" model to help companies of all sizes to build and access technical talent at multiple levels (fully described in a separate section).

The next stages of this process include down-selection and validation of a final model, presentation to the CCAM Board of Directors and ratification by our entire membership. As these changes represent a fundamental change to how we have operated in the past, we are working hard with our members and stakeholders to ensure that the new model will meet the needs of all stakeholders.

Pursuit of Federal Funding

The success of CCAM in generating revenue through execution of federal grants has a significant multiplicative effect for the region and the Commonwealth of Virginia as a whole. As such, federal funding remains a key element in CCAM's strategy for economic impact for the Commonwealth, CCAM members, and CCAM's long-term sustainability. The funds provided by the Commonwealth for CCAM's pursuit of federal funding are accelerating CCAM's pursuit of large federal programs for the region. For example, CCAM has been an integral core team member on Activation Capital's $53M Economic Development Authority Build Back Better grant, GENEDGE's Mobile Technology Insertion Program, Austal's AMPro/Sub Center of Excellence at the IALR in Danville, as well as new NSF and EDA programs geared towards building up the pharmaceutical advanced manufacturing hub in the Richmond and Petersburg areas. Of note, CCAM recently was the lead applicant on behalf of the pharma coalition in seeking a coveted EDA Technical Hub designation. All these programs have a significant focus on innovative technology, SMMs, workforce development and education. These programs resulted from efforts with significant collaboration between multiple entities within the Commonwealth.

Overall, CCAM's plans to achieve federal grant awards (which are the announced and approved full budget amount for each individual grant over the entire duration) and then realize revenue over time from those federal programs have been based upon historical trends: 'typical' grant funding follows an extended timeline to propose, review, award, contract, execute, and then invoice, which results in a delay in revenue realization following initial efforts and award announcement. It is common for there to be a 1-to-2-year period from initiation of a campaign to secure federal funding until award announcement, and for award announcement to precede revenue realization by another year. For example, CCAM was Awarded a $750k Grant from ONR in FY20, which would be the year that we track the full amount of the Award. In the first year of the execution of the grant, we expended $200k, which was recorded as Revenue for FY21. Similar expenditures have or will occur in the following years: thus, a $750k Award in FY20 leads to $150-200k in CCAM Revenue in each of FY21 through FY24. In practice, this means that achieving CCAM's goal of $4M in federal funding revenue annually by 2026 requires award amounts at the $4M level for at least two prior years.

In FY23, however, some of CCAM's major grants (including the AM Pro/Subs program for the US Navy) did not follow the 'typical' award process. Due to the method of securing funding within the government, award

amounts are not being announced prior to full program initiation, but rather are released quarterly on a running basis for the foreseeable future. The result of this is that award amounts are announced at the same time that execution begins. Accordingly, award amounts are much less of a leading indicator for these types of funding programs than they are for 'typical' grant programs.

Revenue from Federal Grants

In FY23, CCAM began to see the positive impact on revenue of the increase in investments in federal program development. Revenues increased significantly in FY23 to $1.1M, exceeding internal targets by 23%, which is a YOY increase of 122% over FY22 (Figure 3). This reflects revenue received from successful execution of programs awarded in prior years as well as the previously discussed deviation in the funding profile of some federal grants from typical scenarios. At the time of this report, revenue from federal grants in the first two months of FY24 are following this same trend.

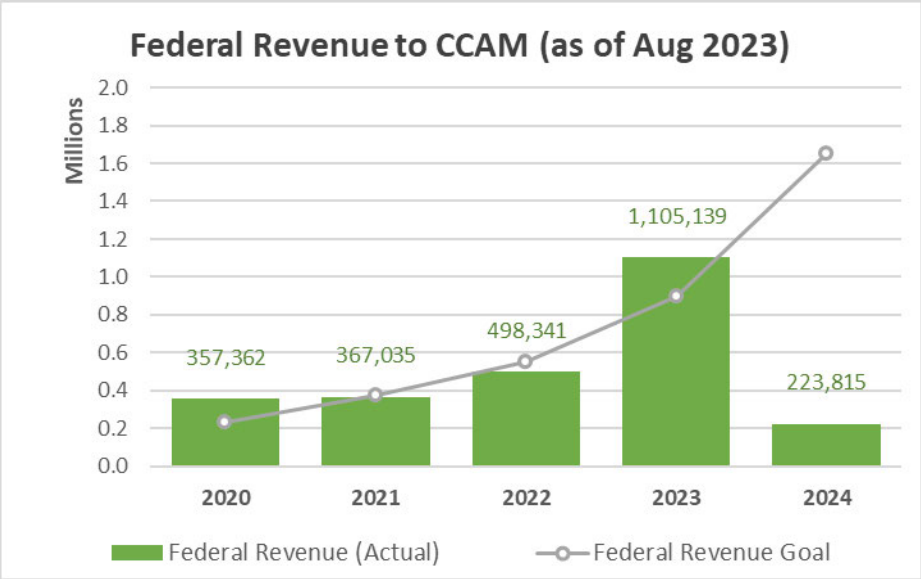

Figure 7: Federal Revenue to CCAM (as of August 2023).

Figure 8: Federal Award Amounts to CCAM (as of August 2023).Figure 9: Federal Revenue to CCAM (as of August 2023).

New Awards of Federal Grants

CCAM's federal funding plan proposed in the first half of FY21 has seen accelerated growth due to the funding allocated by the Commonwealth late in FY21 to help kick-start the process. CCAM's federal awards results show good progress: in FY23, new awards of federal grants increased YOY by 10% and 3.8X over FY20 (Figure 4). Details on the awards comprising the $1.47M total for FY23 can be found in Table 2.

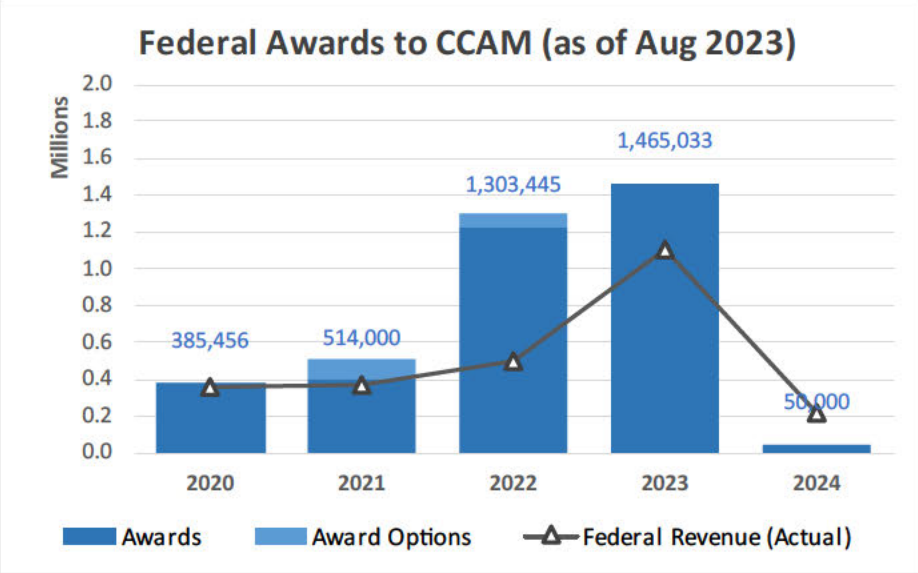

Figure 10: Federal Award Amounts to CCAM (as of August 2023).

Table 4 - Federal Awards to CCAM (FY23)

Agency	Project	Prime	Est Total Award	CCAM Award	Award Year
US Air Force	Cloud-Based Tools for Severity Monitoring and Asset Management	LunaLabs	[redacted]	35,000	2022
US Navy	AM Pro Sub	Austal USA		982,033	2023
AFRL	IIOT Supply Chain Analysis	ARM		248,000	2023
EDA	Alliance for Building Better Medicines Supply Chain Project Management	Activation Capital		175,000	2023
NSF	NSF Career Award - Radhika Barua (VCU)	VCU		50,000	2024
		Total		**1,490,033**	

As discussed previously, this FY23 YOY increase is more significant than it may appear. In planning, revenues are expected to lag award announcements in this growth period by about 12 months; accordingly, revenues in FY23 were expected to be about 50% of award amounts. However, in this case they were 75% of the award amounts. This is due to the mechanism of award allocation for the AM Pro/Subs program, which was initiated by the US Navy without long-term funding in place. As such, funding (and thus the award) has only been made available on a rolling basis every quarter instead of in one initial, larger award. With approximately $1M awarded to

CCAM so far, and work anticipated at similar levels over the next few years, this program would have traditionally appeared as an award in FY23 on the order of $[redacted]. Instead, it will appear in the year of execution in amounts on the order of $[redacted]. Additionally, the MTIP program led by GENEDGE, for which CCAM will have a significant support role, was congressionally funded but has been caught up in challenges within existing IBAS funding mechanisms. Funding for this program is currently delayed.

Pipeline of Federal Opportunities

Support from the Commonwealth has made it possible for CCAM to engage actively in the federally funded community, build relationships, and pursue these larger programs. Without this support, the timeline for the planned growth would be significantly longer. It has enabled CCAM to increase effectiveness of efforts through investment of resources to the challenge. In doing so, CCAM continues to refine its approach to securing federal funding. Some of the adaptations that are leading to improved success include:

- Improved engagement with federal programs, processes, and timelines for funding opportunities, including expanded use of experienced consulting resources that are helping to open doors and expose CCAM to opportunities.
- Improved understanding of which agencies have development needs that overlap with the CCAM community's capabilities, needs, and interests and developing their confidence in CCAM's ability to deliver results.
- Expanded network of motivated and capable collaborators, which organizations fit best in which industry/process space to partner with in which ways with a focus on collaborations that lead to success.

Overall, the federal award pipeline is strong, with a number of good target opportunities that have good probabilities of securing funding. CCAM is projecting near term awards of approximately $3.5M (probability weighted, see Figure 5). It is important to note that there have been substantial shifts over the past 1-2 years in federal funding programs. Many of the traditional programs still exist at similar funding levels, but there are new sources of funding that are focused on new or different objectives and at a larger scale. These calls are pushing for a shift to broadly collaborative initiatives requiring multi-functional and multi-organizational communities to invest and engage together in order to achieve success. Due to its long-standing collaborative model and practices, CCAM is finding itself as a key partner in a number of these initiatives.

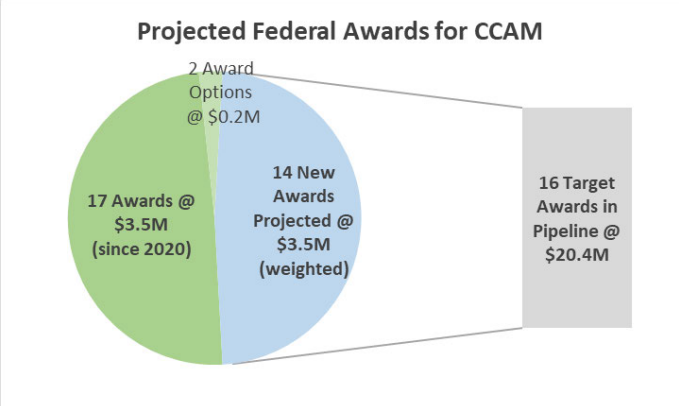

Figure 12: Projected Federal Awards for CCAM.

Strategic Federal Opportunities

Pharmaceutical Cluster Economic Development

CCAM has been an integral core team member on programs geared towards building up the pharmaceutical advanced manufacturing hub in the Richmond and Petersburg areas. CCAM is proud to be a core partner of the Alliance for Building Better Medicine. The Alliance for Building Better Medicine, a coalition of public and private sector stakeholders in the Richmond-Petersburg region, and Governor Glenn Youngkin recently announced $111 Million of investment by federal, state, local, and private supporters to accelerate the development of the Advanced Pharmaceutical and manufacturing Cluster (APC) emerging in Central Virginia. CCAM partnered with Activation Capital and the APC for the recently awarded $52.9 million US Economic Development Administration's (EDA) Build Back Better Regional Challenge grant. In February of 2023, CCAM also stepped up to fill a critical need in providing a project management resource for the supply chain project. In addition to the program management role, CCAM is contributing to the ABBM with active members on the Board, serving on the Governance Committee, the Infrastructure Committee, the Workforce Development working group, and playing a larger role in seeking additional external funding for the APC. In addition, the CCAM team has hosted several VIP visits at its facility, including multiple "site selector" visits hosted by the Richmond and Virginia Gateway Regions' economic development teams – and a very well-regarded visit by the US Under Secretary of Commerce for International Trade, Marisa Lago.

Figure 15: CCAM and other core team members during the celebratory BBB Regional Challenge announcement by Governor Glenn Youngkin.

While the EDA grant had been a great catalyst for the APC, it does not fully cover critical positions and activities required for the ABBM to achieve its goals. The APC must seek supplemental funding to address key gaps. One of these gap areas is in developing the strategy for workforce development for the APC. In conjunction with the ABBM Executive Director and Community College Workforce Alliance (CCWA) Vice President, CCAM led and was awarded a $40k workforce development grant that will be leveraged by the team to complimentary execute workforce strategy development.

CCAM has been a proactive member in seeking additional large grant funding on par with the BBB grant. As a team member and significant contributor to Activation Capital's ABBM NSF Regional Engines Type 2 proposal, focused on adding Key Starter Material development to the region, which builds on the BBB focus on the development of Advanced Pharmaceutical Ingredients (APIs). Recently, the NSF has indicated that

the team needs to further develop leadership, governance, and intellectual property structure, and they are expected to instead award a Type 1 strategy development ($1M, 18-month) grant for the ABBM team, including CCAM, to develop this needed structure. At the conclusion of this Type1 grant, the cluster would resubmit for the larger ($50M - $100M) Type 2 grant.

Lastly, CCAM recently was the lead applicant on behalf of the APC in seeking a coveted EDA Technical Hub designation. This proposal was, to the best of our knowledge, the only Virginia-based EDA Tech Hub proposal that received a Letter of Support from the Governor's office. If awarded this fall, CCAM will lead an APC proposal for a stage 2 grant ($50M -$100M) at the end of the year.

CCAM's teaming efforts to help the Richmond-Petersburg region develop a regional Advanced Pharmaceutical Cluster has been broad. Active in BBB programs project management, board participation, workforce development, economic development activity support and contributing to and leading various large scale proposal efforts, CCAM is a key contributor in APC development.

Congressional Adds

In FY23, CCAM submitted two requests for congressional funding in the FY24 federal budget focused on [redacted]. The prognosis for securing this funding was strong prior to the ongoing political turmoil associated with funding the federal government. However, the current potential for an extended government shutdown puts the success of these efforts at risk; it is possible that agreements reached to avert national challenges adversely impact individual funding efforts like these.

Funded Programs

CCAM has secured funding from the Office of Naval Research for the option years to continue research that is helping to determine the path to digitization and qualification of complex, multi-step processes that leverage additive manufacturing for naval part repair. Work in this three-year program continues and is planned to feed technology to a major new program that CCAM is supporting. This program, led by Austal USA and in partnership with others (including Virginia entities IALR, UVA, the Spectrum Group, FasTech, etc), was initiated early in FY23 by the US Navy's Strategic Submarines acquisition program. In this program, the US Navy has recognized that significant supply chain challenges put at risk the growth and quality of production needed for both the Virginia

class submarines as well as the new Columbia class strategic submarines. The development of the Navy's Additive Manufacturing Center of Excellence in Danville, VA, will promote the growth and resilience of the Submarine Industrial Base through establishment and expansion of dedicated additive manufacturing and non-destructive testing (NDT) capabilities and other supporting technologies. CCAM has a critical role for the AM Pro/Sub program by 1) defining the digital strategy for implementation and 2) shepherding the development and validation of new technologies for the COE and SIB.

Beginning in FY22 and expanding in FY23, CCAM has secured federal awards that have strategic importance to solving technological aspects of systemic supply chain challenges. In particular, CCAM is actively leading a cross-industry effort to define technology gaps within and across different supply chains in order to develop a roadmap for the Manufacturing USA network. Due in part to this work, CCAM is also studying gaps and challenges to implementation of digital thread technologies for the US Air Force supply chain. Each of these programs has significant collaborative elements, and CCAM is drawing in a large number of partners, both inside and outside the CCAM community.

CCAM continues to execute and pursue medium-sized projects that are driven by specific funding sources, partnerships, and/or research objectives. These projects are funded at medium to low levels and may have shorter periods of performance than the 'typical' program of record. Examples include [redacted]. CCAM continues to pursue opportunities such as these that complement strategies, partner objectives, or research capabilities.

On the smaller scale, CCAM also continues to support numerous partners that benefit from the expertise, equipment, and talent at CCAM as they work to secure federal funding. These efforts typically range from CCAM providing advice and support without direct funding, to providing a low level of funded support during execution on research programs, to support of Phase 1 SBIRs. Examples include faculty at partner universities, such as a recent NSF Career award for Dr. Radhika Barua at VCU, and low-level support for two recent SBIRs with Luna Labs.

Enhancing Collaboration

Collaboration is a key element of CCAM's identity, it is a core value and goal for the CCAM team to achieve in all aspects of what we do. Accordingly, CCAM is constantly striving to expand and enhance collaboration with and among existing membership, community partners, and new opportunity partners. CCAM is increasingly looked to by its partners as a broker of collaboration, helping to lead, facilitate, and/or support development of collaborative multi-functional and multi-organizational teams. This has extended across industries (and government agencies) and throughout supply chains, including organizations that have not been traditionally part of the CCAM community, such as regulatory bodies like USP, Small- and Medium-sized Manufacturers (SMMs), consultants and small capability providers, industry groups, etc. CCAM continues to seek means to expand and enhance collaboration through research programs, community interactions, focused events, and more.

CCAM Technology Days – May 23rd & 24th 2023

As a means to better connect the industrial and academic technical communities, CCAM launched its first Technology Days event in May of this year. The idea is to annually select a partner University and showcase their research work as it applies to industry, along with that of the other CCAM Organizing University Members and CCAM's own team. This year, we selected VCU to host the event, which was attended by approximately 50 guests who participated in 1-1/2 days of engaging conversations and laboratory demonstrations. In May, 2025, the CCAM community will again come together for a Technology Days event, this time hosted by Virginia Tech in Blacksburg, which is already generating interest from CCAM members.

CCAM Research Days – November 14th & 15th 2023

Upcoming in November, 2023, CCAM will hold its annual in-person Research Days event. Last summer, CCAM held its first in-person Research Days event since prior to the pandemic. CCAM brought together both suppliers and consumers of Digital Thread technologies to discuss and demonstrate application opportunities to use digital data to help make manufacturing processes and supply chains more efficient and effective. Our goal was to showcase the different industry sectors that digital thread is and can be applied in, and to brainstorm with both members and potential members about possibilities to extend applications to further support their businesses.

This event received overwhelming support and praise from our members, Board of Directors, potential members, and community stakeholders, with >140 people in attendance.

For 2023, CCAM's Research Days event will both incorporate many of the key manufacturing technologies being pulled by manufacturers, and pivot to embrace one of the biggest operational challenges faced by companies: Supply Chain Resilience. The event will showcase presentations, panel discussions, and demonstrations from leaders in Supply Chain Resilience, key government advocates, and of course, CCAM's research team.

Figure 18: Save the Date! Flier for the Upcoming CCAM Research Days Event.

University Collaborations

Figure 19: Members of the FAME Classes of 2024 and 2025 at CCAM.Figure 20: Save the Date! Flier for the Upcoming CCAM Research Days Event.

CCAM continues to work to enhance and expand collaboration with its university partners, with the goal of growing the communal pool of federally funded research programs. This includes building on past collaborations as well as forging new teams that are strategically aligned around opportunities. One of the key collaborative growth efforts that CCAM is expanding relates to capability and talent development. This fundamental challenge for many industries and government agencies is woven into many aspects of new opportunities, and the CCAM community is working to leverage newly enhanced collaborations with its university partners to systemically change the supply of technical talent that is prepared to manufacturing demands.

Strategic Focus

The Commonwealth provided funding to CCAM for research collaboration (Innovation Funds) that is being used to develop capabilities, deepen team skills, and produce 'seed' results that tie directly into the strategic & programmatic initiatives to which CCAM is a contributing partner. As CCAM has refined its understanding and approach to securing federal funding, the use of these funds continues to be more targeted and purposeful. In FY23, CCAM focused on applying these funds to programs that either individually align with ongoing and future CCAM work, or where faculty and students across multiple universities can contribute and support a larger strategy. This transition in focus, and the associated effort required to build some of these programs, have taken longer than anticipated. Thus, although strategically planned, not all the funding provided by the Commonwealth for FY23 has been spent on this program and accelerated efforts continue in FY24.

One powerful example of the strategic and multi-faceted utilization of these funds is in an ongoing convergence of programs with VSU and VT. For several years, CCAM and VSU have partnered to assist VSU to develop shared

manufacturing laboratories, replete with production-level equipment from leading companies. In large part due to federal grants to VSU, high-end manufacturing equipment has been procured and placed at both CCAM and VSU facilities. These efforts culminated in FY23 with the installation and commissioning of $1.2M of machining, additive manufacturing, and measurement work cells in a new VSU laboratory. As part of the CCAM community collaboration, maker space labs at VCU have provided the VSU with proven laboratory procedures and processes to help stand up the space more quickly, and CCAM engineers are supporting installation, setup, and operation of the equipment alongside VSU staff, which includes training faculty and students on safe and productive operation. This equipment is part of the convergence of two major initiatives through CCAM: developing talented engineers for manufacturing and pushing development of flexible and distributed manufacturing technologies. In the first case, CCAM is partnering with VSU faculty to build course and lab projects for training, familiarization, and exploitation of these capabilities, with a Special Topics course planned for rollout in the 2024 Spring semester. In the second, CCAM and VSU have partnered with Virginia Tech to kick off an Innovation Fund project (E-103), to leverage this equipment and its ability to train and familiarize students at VSU. This project builds upon prior work CCAM performed for NIST to develop a reference testbed at CCAM for flexible and distributed manufacturing by updating the digital architecture and tools to then package, distribute, install, and operate at the new 'node' at Virginia State University. In preparation for rollout of this architecture, VSU placed two students at CCAM for the summer of 2023 to gain valuable baseline skills in computer engineering that are required to support the program.

Faculty resources

In addition to key liaisons and collaborations with faculty at CCAM's partner universities, Virginia Tech has been working to hire a full-time collaborator for CCAM. In early 2023, Virginia Tech hired Tao Sun, PhD, as a CCAM Research Fellow in Digital Manufacturing and placed him at CCAM. Dr. Sun received his PhD in mechanical engineering from the University of Hong Kong, and recently completed an assignment as research assistant professor at West Virginia University working on research seed grants as well as developing a course in MEMS technology. He has a personal research focus in flexible electronics for neural applications. This placement is an important connection between Virginia Tech and CCAM, and his focus is to expand the collaboration of Virginia Tech with CCAM as well as others in the CCAM community.

Several CCAM employees are directly supporting instruction at nearby Virginia State University, serving as adjunct faculty for engineering courses and helping to develop new course content relating to manufacturing.

Student Resource Sharing

The recent pandemic was a significant challenge to collaboration with the university partners, particularly regarding student engagement through internship and similar mechanisms. However, since students began to come back to campus and CCAM, there has been a significant intentional effort to increase the 'sharing' of students in collaborative activities. Students have been moving back and forth between CCAM and their university in ways that best match their academic schedules and have become significant contributors to those individual programs as well as the federal programs that they are intended to feed.

One example of this collaborative resource sharing is the relationship developed with Dr. Prahalada Rao, a recent faculty addition at Virginia Tech. Dr. Rao has developed a novel approach to fast modeling for additive manufacturing processes that could provide means to more effectively avoid process problems for new build plans, accelerating development and enabling higher quality at lower cost. CCAM has worked with Dr. Rao's team on an Innovation Fund project, E-106, where several talented PhD students began work while at VT and transitioned to work at CCAM over the summer of 2023, both in direct support of that collaborative effort as well as on other funded research programs at CCAM. Those students are now back at VT and continue to work remotely on important federally funded programs for CCAM, [redacted]. Similar relationships and resultant collaborative resource sharing are ongoing with multiple faculty across the CCAM community (such as work with Dr. Radhika Barua and her students at Virginia Commonwealth University, and more) and CCAM is working to expand these collaborations.

Student Skill-Building

Collaboration with faculty and academic labs to provide skill-building opportunities to students prior to engagement in direct intern-like programs. CCAM has provided guidance and support to engineering senior (Capstone) projects, provided direct mentoring and skill-building to students at CCAM funded through federal grants, and hands-on daily mentoring on CCAM intern programs. CCAM is working to expand these activities and secure funding sources to enable broader implementation.

Workforce Development

Central Virginia FAME

CCAM continues to play a significant leadership role in the growth and effectiveness of the Central Virginia Chapter of the Federation for Advanced Manufacturing Education (FAME). Over the past year, the ranks of the Chapter's Core Member companies have increased from nine to sixteen, with companies from Ashland to Emporia now joining forces to solve challenges in developing a talent pipeline for technical maintenance roles; long recognized as a critical workforce gap in Central Virginia.

Figure 21: Members of the FAME Classes of 2024 and 2025 at CCAM.

The first cohort of students (launched in the middle of the pandemic) graduated from CCAM partner Richard Bland College with full Associate of Science degrees in May 0f 2023. ALL of the students who completed the program were offered full-time employment by their sponsoring Core Member companies, underscoring the winning recipe of FAME that combines mentor-based on the job experience with the technical laboratory and classroom learning that students receive at CCAM and Richard Bland College respectively. Some of the FAME Core Member companies who are also research members at CCAM are clearly seeing how the program has a multiplier effect of benefits for them and are "doubling down" to increase their participation AND to expand some of the FAME laboratory training to include upskilling of their incumbent employees.

Central VA FAME's second cohort is now halfway through their program, with students and employers building on the success of the previous cohort. FAME technical content instructors now include a CCAM research engineer, who brings an even higher level of depth and real-world experience to the Program. Together with support from the Core Member companies, the program content is regularly evaluated to ensure that it meets the needs of both the employers and the student participants.

In August of 2023, the third cohort launched at the CCAM facility, and with 10 students currently enrolled is the largest cohort to date. Employers, students, and their parents all participated in the orientation event, so that all could experience the world-class program that they were embarking on. As word has spread about the FAME program, the level of student interest across many of the region's school divisions has increased dramatically. Current enrollees in FAME are the programs best ambassadors, with many returning to their alma-mater high schools to demonstrate a path for career success to younger students.

Throughout 2023, the CCAM team has worked with appointed leaders from Virginia's government to ensure that FAME and technician level workforce programs are top of mind in the Commonwealth. In May, Secretary of Labor Bryan Slater, Commissioner of the Department of Labor and Industry Gary Pan, and several elected officials were among guests for tours of several of the FAME Core Member manufacturing companies. As discussions continued in August, the Commissioner of the Virginia Employment Commission Carrie Roth entered the conversation as we jointly discussed how to further make great career opportunities available to disadvantaged members of the community.

GO TEC

GO TEC
Great Opportunities in Technology and Engineering Careers

CCAM is leading the charge to build a STEM-energized workforce pipeline in Central Virginia by connecting with students as early as 6th grade. In December 2022, the State GO Virginia Board approved a Competitive Grant by the Institute for Advanced Learning and Research (IALR) in Danville to establish In-Region Coordinating Entities (IRCEs) in GO Virginia Regions 1, 4, and 5. CCAM, supported by partners VSU College of Engineering and Technology and Brightpoint Community College is the IRCE for Region 4, and is currently in-process of building out a GO TEC Teacher Training lab in their facility in Prince George County. The CCAM lab is already staffed by a technical expert from the IALR who supports local school divisions with GO TEC implementation.

Figure 24: Leaders from Colonial Heights, Dinwiddie, Hopewell, Petersburg, and Surry schools meet with the GO TEC team at CCAM to formally kick off the project.

In June 2023, GO Virginia approved a per-Capita grant for CCAM to coordinate the establishment of GO TEC Career Connections labs in the middle schools of the cities of Colonial Heights, Hopewell, and Petersburg, and the Counties of Dinwiddie and Surry. These five labs will join an already established GO TEC lab in Greensville County as the first of their kind in GO Virginia Region 4. As IRCE, CCAM is managing the overall project to ensure that all of these school divisions' 6th, 7th and 8th grade students are exposed to great career opportunities in STEM fields including:

- IT Coding & Networking
- Automation & Robotics
- Welding
- Precision Agriculture
- Metrology
- Electrical Engineering
- Precision Machining
- Biotechnology
- Mechanical Engineering
- Manufacturing Engineering
- Healthcare Technologies
- Pharmaceutical Manufacturing

All the GO TEC Career Connections focus areas are designed to develop interest in high-demand industries of strategic importance to Virginia. The Career Connections labs in the Region's middle schools are expected to open by the beginning of the '24-'25 school year, and CCAM is working with resources from the IALR to both

finalize curriculum content and equipment selections for the latest modules, and to engage with additional school divisions in Region 4 to begin the planning process for labs in their schools.

CCAM Internship Program

CCAM's Internship Program in collaboration with our Organizing University Members has accommodated over 250 Interns and Graduate Research Assistants (GRA) since its inception in 2016. Our internship program is focused on providing Interns and GRAs applied learning opportunities that they can use in industry. For the Summer of 2023, 50% of Interns were from underrepresented backgrounds and over the years, more than 30% of our Interns were from Virginia State University, a Historically Black College and University. Members of the CCAM team invest time to support current interns and potential future intern candidates with career counseling advice, resume building support, and interview preparation. CCAM is proud to have been recognized again by the Virginia Talent + Opportunity Partnership as a 2023 "Top Employer for Interns". This award acknowledges the value that our Internship Program delivers to employers, students, and Virginia's economy.

Figure 27: CCAM was again recognized as a top employer for interns in 2023 by the Virginia Talent and Opportunity Partnership

Talent Incubator Model

During CCAM's unique conversations, collaborations, and engagements with organizations across different industries, supply chain levels, and organizational types, the challenge of technology worker education and development often arises. It is clear that significant global pressures and high demand are placing heretofore unseen pressures on the talent pipeline, and that there is a highly unique convergence in the CCAM community of talent suppliers, industry/government demand, technology development and insertion, manufacturing and technology capabilities, and quality programs to bring students into manufacturing.

CCAM continues to see itself pulled upon by partners to find ways to address these challenges. Existing programs, in spite of the very high quality of students and instructors, have insufficient access to industry, collaboration, throughput, depth, and breadth, and lack the accelerated timeline necessary to meet demand. CCAM has begun to pull together community partners and leaders to understand and address these gaps, and to create a holistic strategic plan that builds upon active, successful programs along with new approaches in order to deliver transformational change in talent development. CCAM believes that convergent collaboration presents an opportunity for guided, accelerated development of highly skilled talent that is ready to impact manufacturing immediately upon entering the workforce.

This strategic program will create a talent incubation ecosystem with numerous collaborative partnerships will arm students with knowledge and experience working in current and new technologies critical to success of commercial and government industrial manufacturers. This holistic approach will include elements at every stage of development that are geared towards introduction of key skills and technologies early and often. Examples of elements at various stages include:

- Early stage introduction to manufacturing and technology through outreach programs like GOTEC.
- Industry-guided projects that pose industrially-relevant challenges to multi-functional teams.
- Project-based learning opportunities in educational programs (one new program in development is described below).
- Direct engagement in intern and coop programs like CCAM's where students are individually guided and mentored by experts in industrial materials, processes, and technologies in order to grow and further develop skills.
- Insertion into manufacturing internships and coop programs that can leverage and apply those developed skills.
- Immersion programs for working technology professionals for upskilling, new technology familiarization and bootstrapping, etc.

One ongoing development that will be a foundational element of this program is the development of a project-based learning course in Industrial Internet of Things (IIOT) technology at Virginia State University. CCAM staff are collaborating with VSU faculty to build a Special Topics course for introduction in the next spring semester (2024) that includes course content, projects, and hands-on labs in machine controls, data acquisition and industrial communication protocols, process intelligence, and more. CCAM staff, who have been working on these technologies for years to help industry partners insert them into production, will be providing training and coaching for VSU faculty and students. Highly successful students will then be selected for internship and coop opportunities at CCAM and industry partner sites. VSU and CCAM plan to expand this program into a minor or certification that graduating students can immediately leverage as they matriculate into manufacturing careers.

Commonwealth Funding

The Commonwealth has provided critical support for CCAM's mission, enabling new leadership to execute a holistic strategy under the pressure of a pandemic. This, along with sound financial management has positioned CCAM to deliver increased economic impact for the Commonwealth. Federal funding initiatives continue to gain momentum and the ROI for the Commonwealth will continue to grow. There is more work to do, however, and continued funding is needed to achieve this goal. We reaffirm that continued, level funding support is needed during the next biennial funding cycle.

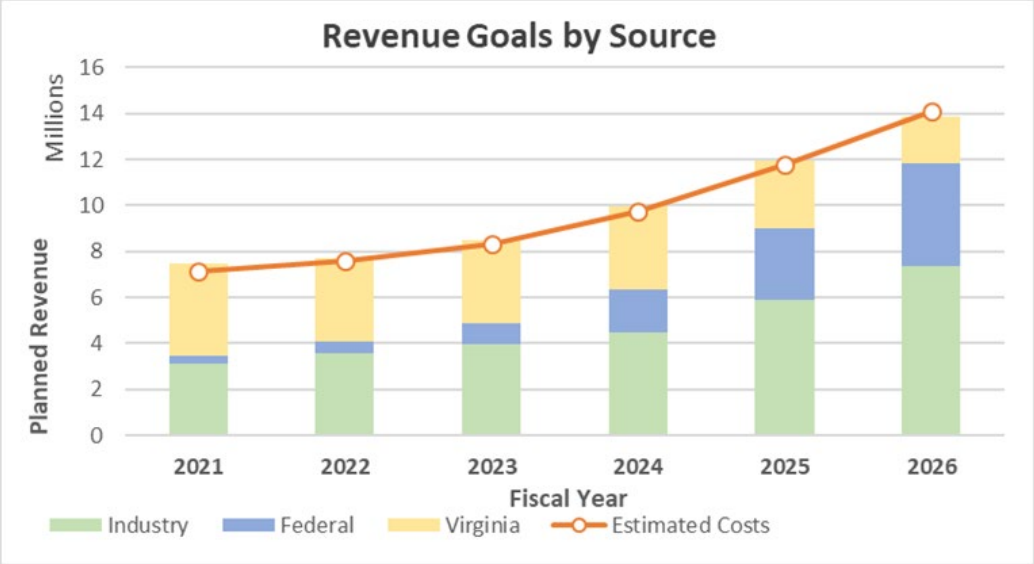

Figure 29: CCAM 5-year revenue plan targeting industrial and federal funding growth.

As noted above, executing the CCAM strategy requires maintaining flat funding for the FY2025/6 biennial funding cycle, which includes the following:

- Continue CCAM's current operational budget allocation from the Commonwealth for $925k. These funds are critical in providing Finance, IT and operational improvements needed to meet federal requirements associated with increased federal funding.
- Continuation of the $1.1M industry grant. These funds have proven to be a vital component in driving additional revenue through existing members while attracting new ones.
- Continuation of the $600K university grant for joint projects and follow-on efforts, including road mapping activities, marketing and proposal development, to continue momentum and leverage previous project activities for the pursuit of CCAM/University jointly funded federal programs.
- Continuation of the $1M appropriation to support federal award program development. CCAM continues to gain traction in the federal space. This funding is key to furthering that growth which results in significant economic impact for the Commonwealth.
- Provide building rent and operations support. Original legislation language outlined the building purchase by DGS and subsequent M&O support beginning July 1 of FY22. As the transaction is still an open item, this remains a critical need for CCAM's success.

HB30 (Chapter 2), Item 127, K.5. Requirements

MOUs with university partners

One MOU, signed January 2019, between CCAM and its Organizing University Members was included in CCAM's Operating Plan submitted to VEDP in July 2019. This referenced university placement of Research Professors and Graduate Research Assistants at CCAM, and university commitments for innovation funding. At that time, UVA, VCU, VSU and VT each committed to placement of Research Professor at CCAM. An MOU was since established between CCAM and ODU in December 2019 to recuse their "placement" of a Research Professor. University commitments have mostly been met over an extended time period.

Funds disbursed to university and private sector partners of CCAM

Item 127, K.2. – Private Sector Incentive Grants

Over the last several years, CCAM has placed a significant focus on utilizing these funds to grow industry investment in CCAM above and beyond the base membership fees. In past years, this was realized primarily through new memberships as well as through investment in matching funds for new projects by current member companies. In both cases, the primary goal has been to incentivize those partners to begin new programs at CCAM that they otherwise might not have invested in or may not have utilized CCAM to achieve. One indicator of success of this approach includes a number of new projects awarded to CCAM that would not have been secured without the incentive funding. In FY23, CCAM utilized these funds to secure several research projects, including two from SMMs that otherwise would have been unable to fully fund CCAM to perform research. Another indicator of success is the level of funding invested by industry partners at CCAM that was not matched directly with Commonwealth funds. CCAM is pleased to report that in both FY22 and FY23 revenue received from member companies above member fees increased YOY by over $500K; a significant portion of this funded research builds upon projects that benefitted from use of incentive funds in prior years. Altogether, in FY23 CCAM has effectively leveraged these funds to grow CCAM's industry research base and is planning utilization of the remaining funds with company partners; several were delayed in committing their dues-based funding, and so not all the allocated funding has been utilized to date. The funds shown in the table below have been deployed as private sector incentives in FY2023 and FY2024 to date. These funds have been designated for research match funding and new CCAM membership.

Industry Member	Detail	Grant Funding
[redacted]	New Strategic Membership (Year 2)	$ 75,000
[redacted]	New Strategic Membership (Year 2)	$ 50,000
[redacted]	Project D-461	$ 38,715
	Project D-500	$ 19,800
		$ 183,515

The funds in the table below have been invested in seed projects that are intended to support skill, technology, and capability development targeted towards growth in industry investment at CCAM. Each of these programs are targeted towards a specific manufacturing process, technology, partner, or industry, and are being marketed to existing and prospective members.

Area of Study	Grant Funding
[redacted]	$ 241,569
	$ 69,113
	$ 59,555
	$ 4,003
	$ 338,358
	$ 10,940
	$ 723,538

Item 127, K.3. – University Research Grants

As discussed in the **Enhancing Collaboration** section, CCAM continues to refine its approach to leveraging these University Collaboration funds, increasing focus on alignment with federal programs and multi-organizational engagement. The funds deployed at CCAM in FY2023 for the projects discussed in that section are outlined in the table below. These Innovation Projects were executed in partnership with CCAM Organizing University Members. All funds not yet allocated are planned to be deployed on related strategic initiatives.

University Member	Detail	Grant Funding
VCU	Project E-095	$ 50,000
VIRGINIA TECH	Projects E-103, E-106	$ 170,591
VSU VIRGINIA STATE	Project E-103	$ 111,590
		$ 332,181

Other agreements entered into with public and private sectors

CCAM has not entered into any agreements with representatives of the public or private sectors that would impact current and future incentive fund disbursements.

Federal Award Program Development

As discussed in the Pursuit of Federal Funding section above, the process of securing federal funds requires a significant level of effort invested in understanding funding agency needs and objectives, building teams, and building relationships, which together provides insight in determining which proposals to pursue and what should be included. These efforts ensure that the process outcomes have higher success probabilities and therefore have higher return on investment. This reality is reflected in the distribution of grant funding detailed in the table below, which summarizes the deployment of funds in FY2023 and FY2024 to date for the purpose of attracting federal funding. The total amount reflects expenditures to date as of the time of this report.

Category	Detail	Grant Funding
Business Development	Engagement with federal agencies, exploration of award solicitation, campaign material development, travel for award related business development, process infrastructure consulting and development (award admin, export control, CMMC compliance).	$ 531,845
Proposal Development	Concept paper & proposal ideation, development and submission.	$ 127,087
Non-reimbursable Federal Award Costs	Federal research program costs not reimbursable on federal research awards.	$ 511,318
		$ 1,170,250

Additional Information Requested

No additional information has been requested at this time.

APPENDIX

Financial Schedules