

Cape Cod Community College  
**USDOL TAACCCT  
Evaluation**

**Final Evaluation  
Report**

September 2018



THOMAS P. MILLER & ASSOCIATES

# Acknowledgements

## Thank you

To the leadership of Cape Cod Community College and the Aviation Maintenance Technology program for your support and active engagement.

To the faculty and staff of Cape Cod Community College for your hard work in implementing the Aviation Maintenance Technology program and your valuable insights about the program.

To the employers, community partners, and participants who met with the Evaluation Team and provided valuable feedback about the program.

To the U.S. Department of Labor and the National Science Foundation for financing this program and evaluation.

## The Evaluation Report

This Final Evaluation Report was developed by Thomas P. Miller & Associates. Evaluation report contributors included:

- Jennifer Bellville, Principal Investigator
- Gina Romano, Statistical Lead
- Brittany Hicks

TAACCCT Grantee:



Independent Evaluator:



THOMAS P. MILLER & ASSOCIATES

*The Aviation Maintenance Technology program at CCCC is funded in part by two federal awards, a \$2,471,478 grant awarded by the U.S. Department of Labor's Employment and Training Administration, Grant # TC-26463-14-60-A-25 and a \$897,935 grant awarded by National Science Foundation and by a \$1,950,000 Massachusetts State Appropriation, # 7504-0102. This workforce product was funded by a grant awarded by the U.S. Department of Labor's Employment and Training Administration. The product was created by the grantee and does not necessarily reflect the official position of the U.S. Department of Labor. The U.S. Department of Labor makes no guarantees, warranties, or assurances of any kind, express or implied, with respect to such information, including any information on linked sites and including, but not limited to, accuracy of the information or its completeness, timeliness, usefulness, adequacy, continued availability, or ownership. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.*

*This work is licensed under a Creative Commons Attribution 4.0 International License.*



Cover Photo: "Highland Lighthouse with Clouds" m01229 // flickr.com

# Executive Summary

## AMT Program

Based on conversations with leaders in the aviation industry, Cape Cod Community College (CCCC) leadership identified the opportunity to offer a Federal Aviation Administration (FAA) certified Part 147 Aviation Maintenance Technology (AMT) program. As a result, CCCC pursued and was awarded funding from three separate funding streams – a U.S. Department of Labor (USDOL) Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant, a National Science Foundation (NSF) Advanced Technological Education (ATE) grant, and a Massachusetts State Appropriation – to help build a new AMT program located in Plymouth, Massachusetts.

CCCC began creating the AMT program in Fall 2014. As of May 2018, the AMT program includes 1,904 hours of instruction with hands-on training and is on a 15-month schedule where students attend school four days a week, eight hours per day. The program is designed so that students who complete will be prepared to test for their Airframe & Powerplant (A&P) Certifications through the FAA. There is also the opportunity to earn Certificates and an Associate of Applied Science (AAS) through CCCC by taking additional general education courses.

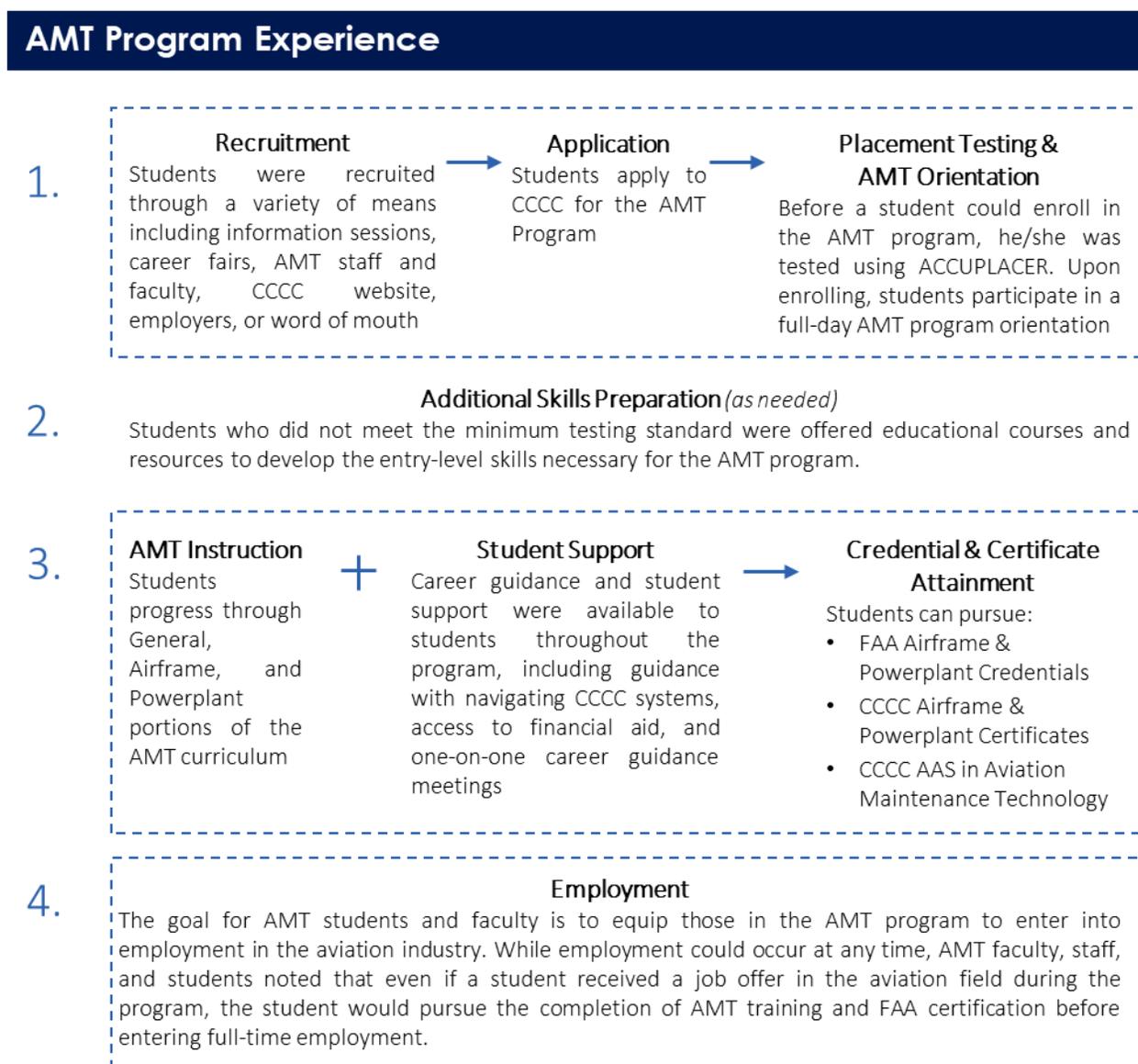
Figure i | Organization of the AMT Program



\*Signifies completion of FAA coursework and clock hours. Required before taking FAA test.

Because the AMT program was new to CCCC and to the area, AMT staff organized a variety of information-focused events to help students and their parents better understand what the AMT program would include. AMT staff also visited career and internship fairs to share about the program and timing for new enrollment periods. Once students applied and took placement testing, they transitioned into the training program. The AMT program offers students smaller class sizes capped at 24 students per cohort, with regular access to AMT faculty for questions and make-up time. In addition, all AMT students have access to a student support staff member who could provide customized supportive services for students, as needs arose. The figure below highlights an overview of the AMT student experience.

Figure ii | AMT Program Sequence



## Program Evaluation

CCCC contracted with Thomas P. Miller & Associates, LLC (TPMA) to serve as an independent, third-party evaluator. The evaluation design included a mixed-methods approach:

### Implementation Evaluation

The Implementation Evaluation began January 2015 and continued through May 2018 to document program progress, monitor program outcomes, and provide recommendations for continuous improvement of program operations. The Implementation Evaluation focused on a series of research questions (see *Research Questions*) to explore the development of the AMT program, employing principles of a utilization-focused framework.<sup>1</sup> This evaluation was primarily qualitative and used a general inductive thematic approach<sup>2</sup> to analyze the data collected through calls, three in-person site visits, and program documents.

### Outcome Evaluation

At the conclusion of the grant, the Evaluation Team conducted an outcomes-only study that asked the *Research Questions: To what extent do outcomes differ between cohorts? To what extent do outcomes differ within cohorts?* Power analyses were performed to determine which statistical tests could be conducted. Due to the small sample size, the analysis focused on descriptive statistics and rudimentary statistical tests (e.g. t-test for independent samples) to address the research questions. To supplement these findings, effect sizes were also computed, as appropriate, which helped substantiate any statistically significant results from these tests.

## Summary of Evaluation Findings

### AMT Program Development

Start-up of the new AMT program required the acquisition of a training facility with classroom and airplane hangar space, which was ultimately found at Plymouth Municipal Airport. Concurrent with finding a location, CCCC worked toward developing new curriculum, identifying and procuring new equipment and supplies, working with employers for equipment and supply donations, and continuing to build out the program by hiring AMT faculty and staff. An important component of the start-up process included collaboration with the FAA to approve the curriculum, equipment and materials, and space so that CCCC could become a FAA A&P Part 147 accredited training facility. With the volume of tasks and decisions that needed to be completed, especially the number of interdependent decisions that needed to be made, the start-up phase required considerable staffing capacity and time.

CCCC received FAA certification of the General and Airframe portion of the program in August 2016, which allowed program enrollment to begin in September 2016. Additional curriculum development and equipment procurement occurred for the Powerplant portion of the program, which was certified by the FAA in April 2017. At that point, CCCC was a fully-certified FAA Part 147 A&P school, thereby allowing for full program operation and permitting the enrollment of multiple cohorts of students. The figure that follows is a high-level overview of key program milestones.

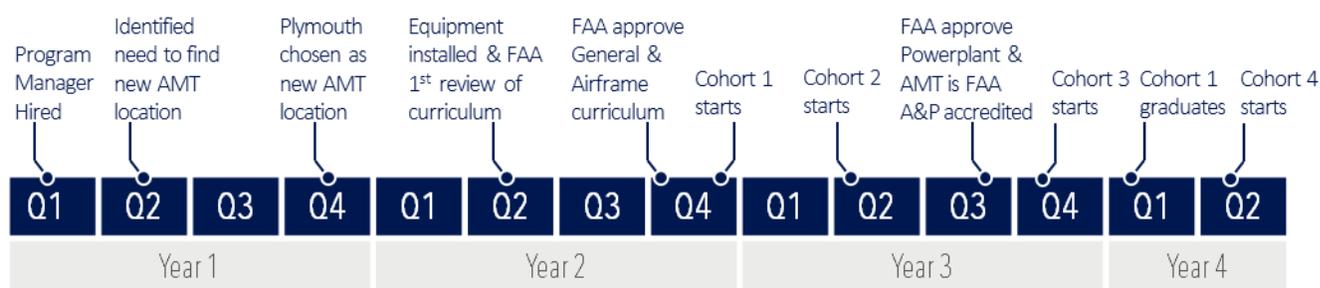
---

<sup>1</sup> Patton, M.Q. *Essentials of Utilization-focused Evaluation*. Thousand Oaks, CA. SAGE Publications, Inc., 2012.

<sup>2</sup> Thomas, D.R. (2006). *A general inductive approach for analyzing qualitative evaluation data*. *American Journal of Evaluation*, 27, 237-245.



Figure iii | AMT Program Milestones During Period of Performance (Oct 2014 – Mar 2018)



## Barriers & Challenges

All new programs experience challenges and changes to plans. In establishing the AMT program, CCCC encountered and overcame a number of barriers, including the following:

**Change in Program Location** – The initial location chosen to house the AMT program was not feasible due to a significant gap in the asking price compared to the appraised value. CCCC had to start over in the search for a location, requiring a bidding process and delaying the decision on program location for several months. This was the first of several delays that resulted in pushing back the student start date.

**FAA Certification Process** – The FAA requires a thorough review of curriculum, equipment, and facilities before approving a new A&P training program. This certification process was challenging because of the rigorous nature of the process, the lack of familiarity of AMT staff with the certification process’ detailed requirements, and the turnover of FAA staff overseeing the approval process.

**Capacity & Interdependent Decision Making** – The identification of a location for the program, the procurement process, and the development and approval of the program’s curriculum all took longer than anticipated and required significantly more capacity. In addition, decisions on materials and curriculum needed to be completed in close collaboration with one another (e.g. equipment specifics chosen based on the curriculum). With strain on staffing capacity at the early stages, there was not enough capacity at the college to be working on both simultaneously.

**Accelerated Program Structure** – The full-time, five-day per week schedule made it difficult for AMT faculty and staff to have time to prepare for courses, perform administrative work, and engage in professional development. The schedule also made it difficult for students to make up hours when they missed class and to access college services like financial aid because the AMT program was not located on the main campus. Learning from this, CCCC shifted the program to four-days a week, beginning with Cohort 3.

## Accelerators & Strengths

The AMT program leveraged a number of strengths, positioning it for ongoing success and sustainability. Among the greatest of these strengths include:

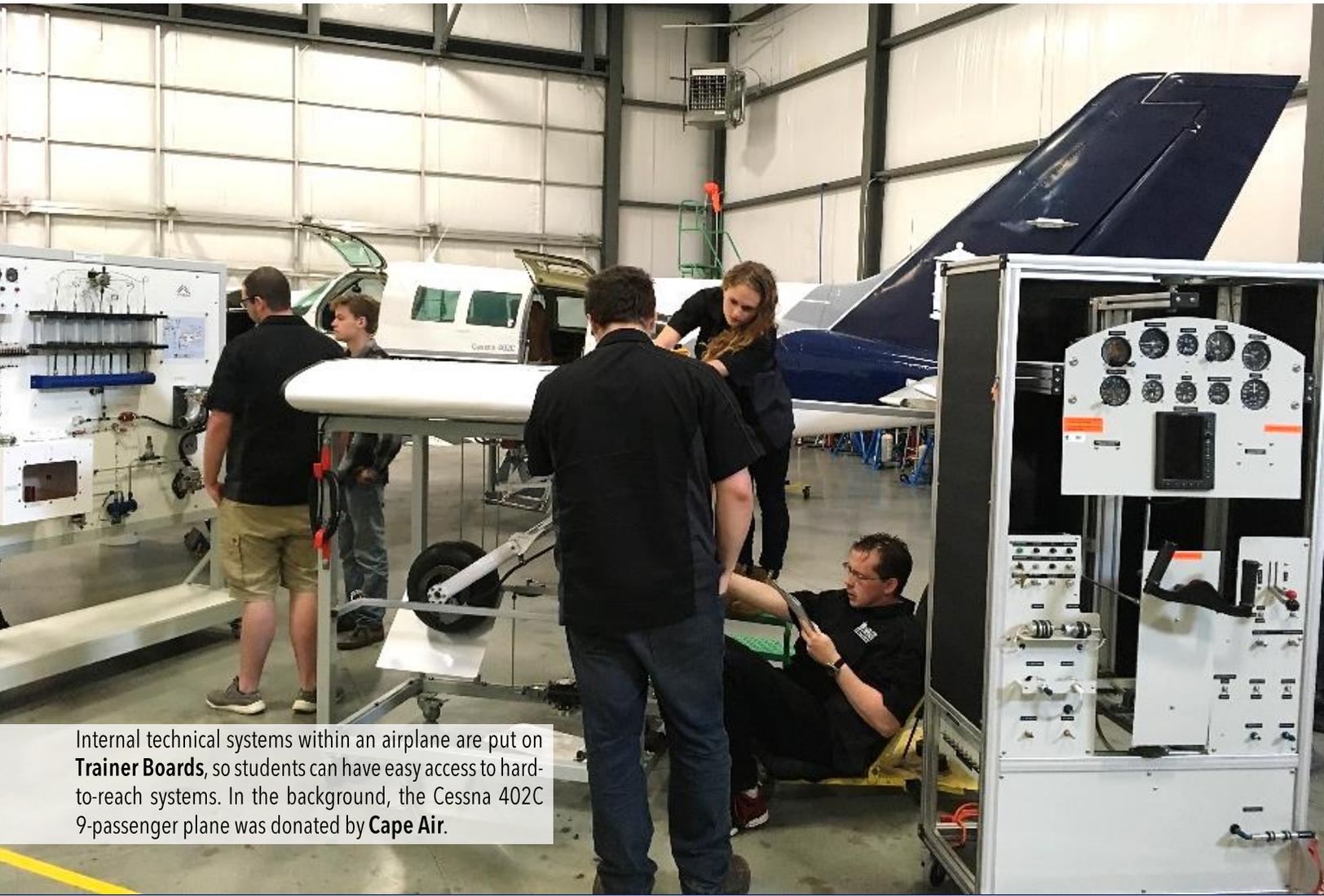
**Adaptation & Flexibility** – CCCC’s ability to shift and adjust staffing to support start-up for the initiative helped the college progress through early barriers to program implementation. In addition, once the AMT program was underway, CCCC focused on continuous improvement by taking feedback from faculty, staff, and students to make program adjustments. These shifts included shifting from five- to four-days a week and beginning the process to increase total instructional hours to build in more

time for possible disruptions in student schedules, more flexibility for course scheduling, and more time to study the more challenging content.

**CCCC & AMT Leadership, Faculty, & Staff Dedication** – Interviewed stakeholders highlighted an “all hands-on deck” approach where leadership, faculty, and staff, were willing to take on significant additional responsibilities for the start-up of the program including curriculum development and procurement processes. This important element accelerated CCCC moving from start-up to program instruction.

**AMT Facility, Equipment, & Location** – Both program staff with previous experience in aviation maintenance programs and corporate partners stated that the facility, equipment, and materials for the program were state-of-the-art – including training boards and simulation systems, a turbocharged fuel injection trainer, and PT-6 turbine engine systems. The location of the hangar in Plymouth was also seen as a strength that helped the college attract more students from Boston and surrounding areas and that benefited students testing for the FAA Credentials as at least one FAA-Designated Mechanic Examiner (DME) was based at the Plymouth airport.

**In-Demand Training & Employer Commitment** – Leadership, staff, faculty, employers, and students reported that the AMT program offered training for in-demand jobs. Due to the need for trained AMTs, employers were engaged in the development of the training program, including donating materials and equipment to support the program’s development.



Internal technical systems within an airplane are put on **Trainer Boards**, so students can have easy access to hard-to-reach systems. In the background, the Cessna 402C 9-passenger plane was donated by **Cape Air**.

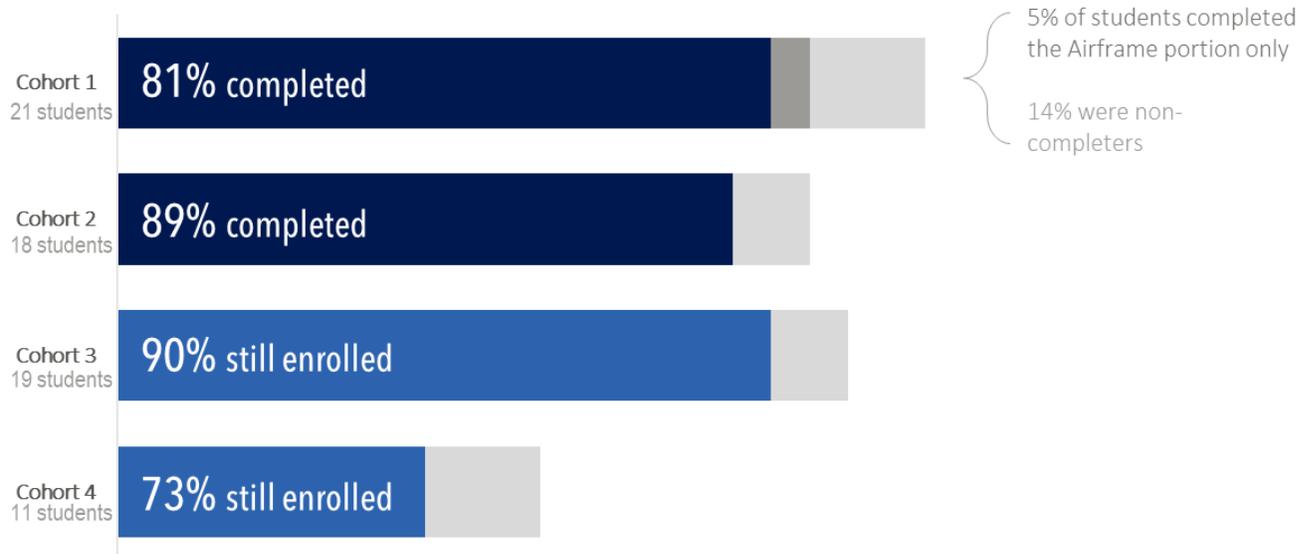
## AMT Outcomes

For the evaluation, completion was defined differently than what was reported to the U.S. Department of Labor (USDOL). Therefore, the results in this report will be different than results submitted by CCCC to USDOL. For the TAACCCT reporting to the USDOL, completion was defined in the reporting guidelines (p. 9) as “having earned all of the credit hours (formal award units) needed for the award of a degree or certificate in that program of study. Participants should only be included once, even if they complete multiple programs.”<sup>3</sup> For a student to be counted as a completer, the individual needed to earn all credit hours required for a college degree or certificate.

To gather a more comprehensive understanding of how students were progressing in the AMT program, the Evaluation Team defined completion differently. For this report, completion was defined as earning a Certificate of Completion, which included completing the aviation coursework and FAA clock hours within that module (i.e. General, Airframe, Powerplant). The Evaluation Team analyzed completion of FAA clock hours by AMT program, completion of FAA credentials, and completion of college certificates, if applicable.

Figure iv | AMT Student Enrollment and Completion by Cohort

The majority of Cohort 1 and 2 students completed the full AMT program, with the majority of Cohort 3 and 4 students still enrolled.



During the course of the grant, CCCC provided AMT training to 69 students through four cohort groups. All students participated in the AMT program full-time and as of May 2018 students from Cohorts 1 and 2 had completed. In general, the four cohorts were similar in background characteristics, where most students were male, white and in their mid-to-late twenties. Most students’ highest level of education was a high school diploma or equivalent, and the majority were employed prior to enrollment in the AMT program. The majority of students in Cohort 1 and 2 completed the entire program, even though the program is

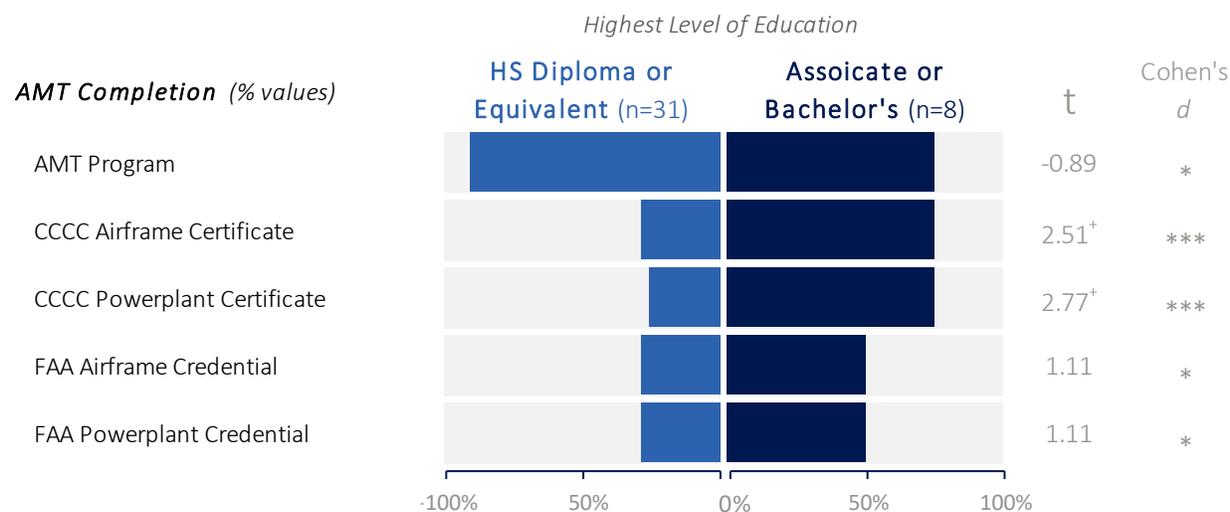
<sup>3</sup> United States Department of Labor Employment and Training Administration (2012). *Trade Adjustment Assistance Community College and Career Training Grants: Annual and Quarterly Program Reporting Forms & Instructions Rounds 2, 3 and 4*. Retrieved from [https://www.doleta.gov/taaccct/pdf/taaccct\\_round2\\_handbook.pdf](https://www.doleta.gov/taaccct/pdf/taaccct_round2_handbook.pdf)



designed with stackable credentials that allow students to complete one portion of the program (e.g. Airframe) and then exit with a CCCC certificate and eligibility to test for an FAA credential. The majority of students in Cohorts 3 and 4 are continuing to persist through the program.

In addition to program completion trends, for Cohorts 1 and 2, students whose highest level of education was some type of college degree (i.e. associate or bachelor's degree) had significantly higher rates of completion of the CCCC Airframe and Powerplant certificates on top of completion of the AMT program curriculum.<sup>4</sup>

Figure v | AMT Student Certificate & Certification Completion



<sup>+</sup>t-Statistic is statistically significant at p<.05

Cohen's d effect sizes are small=.20 (\*), medium=.50 (\*\*), or large=.80 (\*\*\*)

For the students who had completed the AMT program (i.e. Cohorts 1 and 2) and responded to the exit and follow-up surveys, the majority of students were planning to continue their education and were employed. Few students from Cohorts 1 and 2 reported that they were employed in an AMT occupation upon immediate program exit and few students from Cohort 2 reported employment in an AMT occupation during follow-up. This was likely because of the importance of FAA credentials. AMT leadership, faculty, and students all reported that passing the FAA tests were important to employment in the AMT field. For data collected immediately at program exit, most students had not yet completed FAA testing. Similarly, because Cohort 2 students completed in April 2018 and follow-up took place in May-June 2018, there was not enough time for most of the students to take their full FAA credential tests. Future follow-up data collection on student employment and employment in an AMT occupation will be valuable to better understand AMT student placement in FAA career paths.

<sup>4</sup> Note that completion was defined as earning a Certificate of Completion, which included completing the aviation coursework and FAA clock hours within that module (i.e. General, Airframe, Powerplant).



## ***Beyond the Grant***

As a result of the AMT program, CCCC leadership reported that the college as a whole has strengthened its processes and approaches to grant implementation. Through the AMT program, CCCC has further expanded the college's offerings in the area of technical education. Due to its location in Plymouth, the AMT program has also expanded the college's footprint beyond its traditional service area, with the ability to better draw from metropolitan areas such as Boston. Moreover, program faculty and staff have begun working on opportunities to enhance and leverage AMT programming and resources, such as a hybrid AMT program, an Avionics program, and customized employer training.

## ***Future Research***

Based on the findings and limitations of this evaluation, opportunities for additional research can include a variety of quantitative and qualitative studies. For example, future quantitative research could explore:

- The impact of this program on students, once more data is collected about students' wages and employment after exiting, as well as whether students received their FAA credentials.
- The impact of the AMT program compared to a similar group of students.
- A review of factors associated with successful completion to better understand AMT applicants' fit with the program and additional student support services that may be beneficial.
- The correlation between program module grades and FAA testing success to determine how well curriculum is preparing students for FAA testing and to highlight AMT curriculum topic areas that may require adjustment.

Moreover, employer feedback could be gathered and reviewed to determine the extent to which the AMT curriculum aligns with the workforce needs. Future research could examine common delays in establishing new programs at community colleges and how these could be mitigated. Finally, future research could follow CCCC leadership, staff, and faculty who were impacted by the grant during their sustainability efforts to understand the progress of these efforts and effectiveness of various sustainability strategies. Findings from this Evaluation Report and knowledge gained through future research could be used to inform policies for future grant-funded programs.



# Table of Contents

<b>AMT Program</b> .....	1
<b>AMT Evaluation</b> .....	5
<b>Implementation Evaluation</b> .....	7
Design Summary .....	7
Findings Overview .....	9
Program Development .....	10
Program Progress .....	19
Sustainability & Beyond the Grant .....	39
Start-up Advice for Future Programs .....	44
<b>Outcome Evaluation</b> .....	46
Design Summary .....	46
AMT Overview .....	47
Background Characteristics .....	47
Findings from the Outcomes Study .....	49
Research Question 1: Patterns Between Cohorts .....	49
Research Question 2: Patterns within Cohorts .....	51
<b>Conclusion</b> .....	53
<b>Appendix A:</b> Implementation Evaluation Methods .....	55
<b>Appendix B:</b> Outcome Evaluation Methods .....	63
<b>Appendix C:</b> Outcome Evaluation Tables .....	71

# AMT Program

## Purpose & Background

Cape Cod Community College (CCCC) is an accredited, public two-year institution serving Cape Cod, Nantucket, Martha's Vineyard, and areas of southeastern Massachusetts. The main campus is located in West Barnstable, Massachusetts. The college provides an affordable education close to home to a diverse student population, serving over 7,000 individuals each year. The college currently offers 46 Associate of Arts and Associate of Science degrees, and 50 career-building academic certificates in a variety of program areas.

Figure 1 | Massachusetts



Through conversations with employers in the aviation industry around their current and anticipated staffing needs, CCCC leadership identified the Federal Aviation Administration (FAA) certified Part 147 Aviation Maintenance Technology (AMT) program as an opportunity for a new technical program to be offered by the college. As a result, CCCC pursued and was awarded funding from three separate funding streams – a U.S. Department of Labor (USDOL) Trade Adjustment Assistance Community College and Career Training (TAACCCT) grant, a National Science Foundation (NSF) Advanced Technological Education (ATE) grant, and a Massachusetts State Appropriation – to help build a new Aviation Maintenance Technology (AMT) program located in Plymouth, Massachusetts.

As part of grant requirements for USDOL, CCCC procured an independent contractor, Thomas P. Miller & Associates, LLC (TPMA), to conduct an objective evaluation of the AMT program. This Final Evaluation Report includes an overview of the AMT program and findings from the Implementation and Outcome Evaluations.

## Program Design

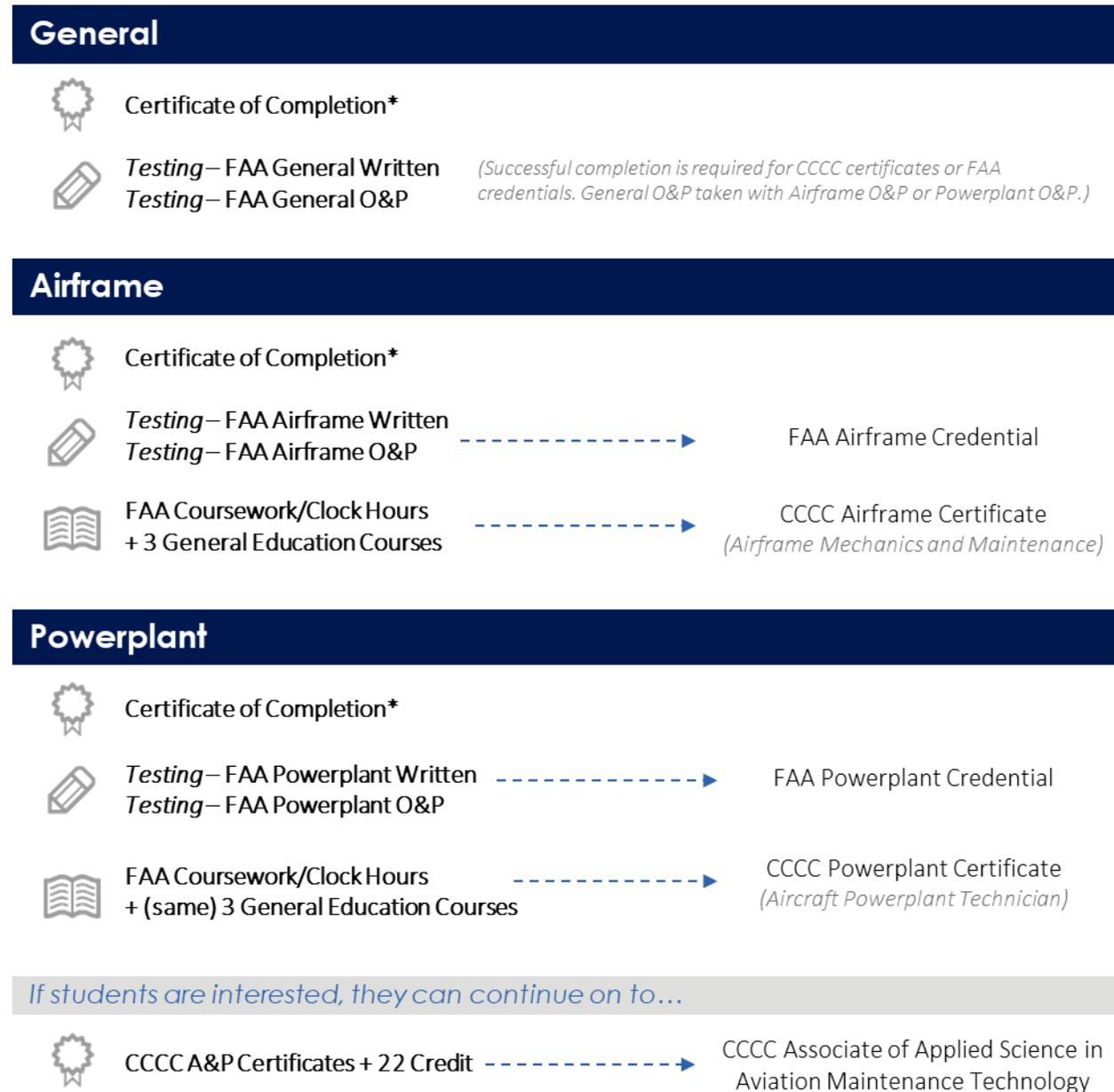
Beginning in Fall 2014, CCCC began developing the AMT program. The program provides students in the eastern corridor of New England an accelerated, accredited curriculum. The AMT program is unique because CCCC is one of only a few community colleges in the U.S. to offer FAA A&P certification training in an accelerated format and is the only such accelerated program in the New England region.

The AMT program is 1,904 hours of instruction and hands-on training. The program began on a 12-month schedule where students were engaged in training for five days a week at eight hours per day. By Cohort 3, the program was adjusted to a 15-month schedule where students went to school for four days a week at eight hours per day. Within the curriculum there are three program modules – General, Airframe, and Powerplant. Each module has two component courses (e.g. General I and General II). When combined, there are 47 topic areas covered across each course (e.g. basic electricity).

The program is designed so that students who complete the program will be prepared to test for their A&P Certifications through the FAA. While obtaining these FAA credentials, there is also the opportunity to earn Certificates and an Associate of Applied Science (AAS) through CCCC by taking additional general education

courses. Components of the AMT program are shown in the chart below in the typical sequential order. FAA testing is optional, but strongly encouraged, and one attempt for each test (e.g. Airframe) is included in each student’s tuition.

Figure 2 | Organization of the AMT Program



\*Signifies completion of FAA coursework and clock hours. Required before taking FAA test.

For additional details around AMT program development and progress see the *Implementation Evaluation*.

## Program Sequence

Individuals who were interested in AMT often experienced the program through the following sequence:

**Recruitment** – Because the AMT program was new to CCCC and to the area, AMT staff organized a variety of information-focused events to help students and their parents better understand what the AMT program would include. AMT staff visited career and internship fairs to share about the program and timing for new enrollment periods. In addition, students were strongly encouraged to attend an Information Session, hosted in conjunction with the CCCC Admissions Office, prior to enrollment.

**Application & Assessment** – Before a student could enroll in the AMT program, he/she was tested using ACCUPLACER to identify the student's general knowledge and proficiency in math, reading comprehension, and sentence skills. Students who did not meet the minimum testing standard were directed toward developmental education courses or another resource (e.g. online tutorials, workshops) to prepare potential students on AMT entry-level skill requirements before they were admitted into the AMT program.

**Instruction & Student Support** – Once enrolled, all students participated in AMT Program Orientation. This was a full-day event that took place at the AMT hangars a few weeks before the start of classes. AMT staff also met individually with the student to complete an Initial Individual Services Plan, which included feedback around how the individual heard about the program and what interested them most in AMT. At any time during the AMT program, students could meet with AMT staff to receive career guidance and student support, including support with registration, resumes, and interview preparation. Students began the program as part of a cohort, and typically progress through the General, then Airframe, then Powerplant modules.

**Credential & Certificate Attainment** – After completing the General, Airframe, and Powerplant portions of the AMT program, students were eligible to test for each appropriate FAA Certification. While FAA Certification testing was not mandatory, it was strongly encouraged by AMT faculty. In addition, after completion of general education courses, students could receive CCCC Credentials (see *Program Design* section for more details).

**Employment** – Ultimately, the goal for AMT students and faculty is to equip those in the AMT program to enter into employment in the aviation industry. While employment could occur at any time, AMT faculty, staff, and students noted that even if a student received a job offer in the aviation field during the program, the student would pursue the completion of AMT training and FAA certification before entering full-time employment.

## Strategic Alignment

The design of the AMT program included alignment with core elements determined by USDOL to be key factors for successful program development:<sup>5</sup>

1. Evidence-Based Design
2. Career Pathways
3. Advanced Online and Technology-Enabled Learning
4. Strategic Alignment with the Workforce System and Other Stakeholders

---

<sup>5</sup> TAACCCT grantee core elements were specified in the Solicitation for Grant Applications (SGA) Funding Opportunity Number SGA/DFA PY-13-10.

5. Alignment with Previously Funded TAACCCT Projects
6. Sector Strategies and Employer Engagement

The concept for the AMT program resulted from conversations with local employers, who highlighted a need for aviation maintenance technicians in their industry. During program development and implementation, CCCC continued to engage employers, including seeking feedback on curriculum and equipment, receiving equipment and supply donations, and hosting employers at the AMT hangar and in AMT classrooms. These activities, highlighted in greater detail within the *Implementation Evaluation*, align with core element 6.

To support the evidence-based design of the program (core element 1), CCCC began with an analysis of (1) employer needs and sector-based strategies, (2) learning styles for TAA and dislocated workers as well as veterans via technology enhanced learning, and (3) credential attainment for rapid employment and job mobility and promotion via career pathways.<sup>6</sup>

Building on this evidence base, CCCC created career pathways (core element 2) into the AMT program design, including opportunities for (1) credential and certificate attainment in Airframe (2) credential and certificate attainment in Powerplant, and (3) Associate of Applied Science degree in Aviation Maintenance Technology. Within the AMT program curriculum, faculty and students use advanced technology (core element 3) through state-of-the-art equipment including electronic simulators, in a curriculum that blends classroom and hands-on learning.

In addition, CCCC leveraged knowledge from a Round 1 TAACCCT grant within the state of Massachusetts – Massachusetts Community Colleges and Workforce Development Transformation Agenda (MCCWDTA) – and also reached out to other TAACCCT grantees and FAA A&P programs with the support of Jobs for the Future’s technical assistance (core element 5).

Finally, the AMT program is strategically aligned with key initiatives within the state (core element 4), including the Massachusetts Governor’s Economic Development Plan “Choosing to Compete in the 21st Century, An Economic Development Policy and Strategic Plan for the Commonwealth of Massachusetts.” The AMT program contributes to three of five goals in the Governor’s Plan: (1) *Advance Education and Workforce Development for Middle-Skill Jobs*—the certificates and degree programs address a high-needs middle-skills area; (2) *Support Regional Development through Infrastructure Investment and Local Empowerment*—the training facilities brought investments of nearly \$5 million to the regional economy and expanded the region’s training and economic capacity; and (3) *Increase the Ease of Doing Business* – by training a strong and capable workforce to support the aviation sector’s need in Massachusetts.

**“We recognize the need in the industry and we recognize the opportunity for our students; and we have the faculty and we have the staff that are enabling that success.”**

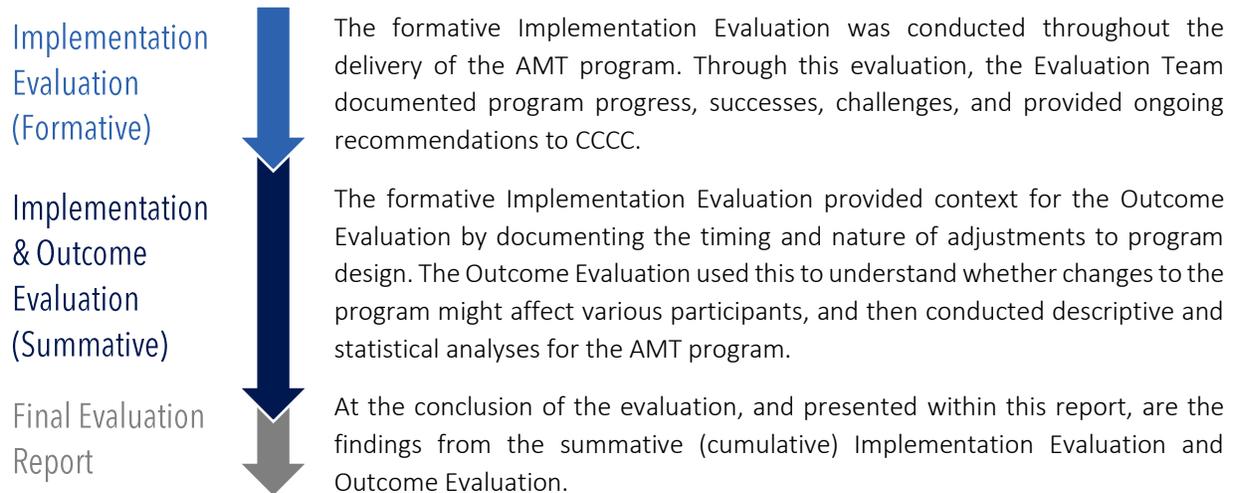
CCCC Leadership

---

<sup>6</sup> Research included: **Sector-Based Strategies** | Sheila Maguire, Joshua Freely, Carol Clymer, Maureen Conway, and Deena Schwartz. *Tuning in to Local Labor Markets: Findings from the Sectoral Employment Impact Study*. Public/Private Ventures (PPV). 2010. **Technology Enabled Learning** | Lily Zandniapour and Maureen Conway. *Progress of Participants of Sectoral Employment Development Programs*. SEDLP Research Report, No. 3. The Aspen Institute Economic Opportunities Program. February 2002. **Career Pathways** | K.L. Hughes, T.R. Bailey and M.R. Mechar. *School to Work: Making a Difference in Education*. New York: Columbia University, Teachers College, Institute on Education and the Economy. 2001.

# AMT Evaluation

CCCC contracted with Thomas P. Miller & Associates, LLC (TPMA) to serve as an independent, third-party evaluator. The evaluation design included a mixed-methods approach:



## Implementation Evaluation

The Implementation Evaluation began January 2015 and continued through May 2018 to document program progress, monitor program outcomes, and provide recommendations for continuous improvement of program operations. The Implementation Evaluation focused on a series of research questions (see *Research Questions*) to explore the development of the AMT program, employing principles of a utilization-focused framework.<sup>7</sup> This evaluation was primarily qualitative and used a general inductive thematic approach<sup>8</sup> to analyze the data collected through calls, three in-person site visits, and program documents.

## Outcome Evaluation

At the conclusion of the grant, the Evaluation Team conducted an outcomes-only study that asked the *Research Questions: To what extent do outcomes differ between cohorts? To what extent do outcomes differ within cohorts?* Power analyses were performed to determine which statistical tests could be conducted. Due to the small sample size, the analysis focused on descriptive statistics and rudimentary statistical tests (e.g. t-test for independent samples) to address the research questions. To supplement these findings, effect sizes were also computed, as appropriate, which helped substantiate any statistically significant results from these tests.

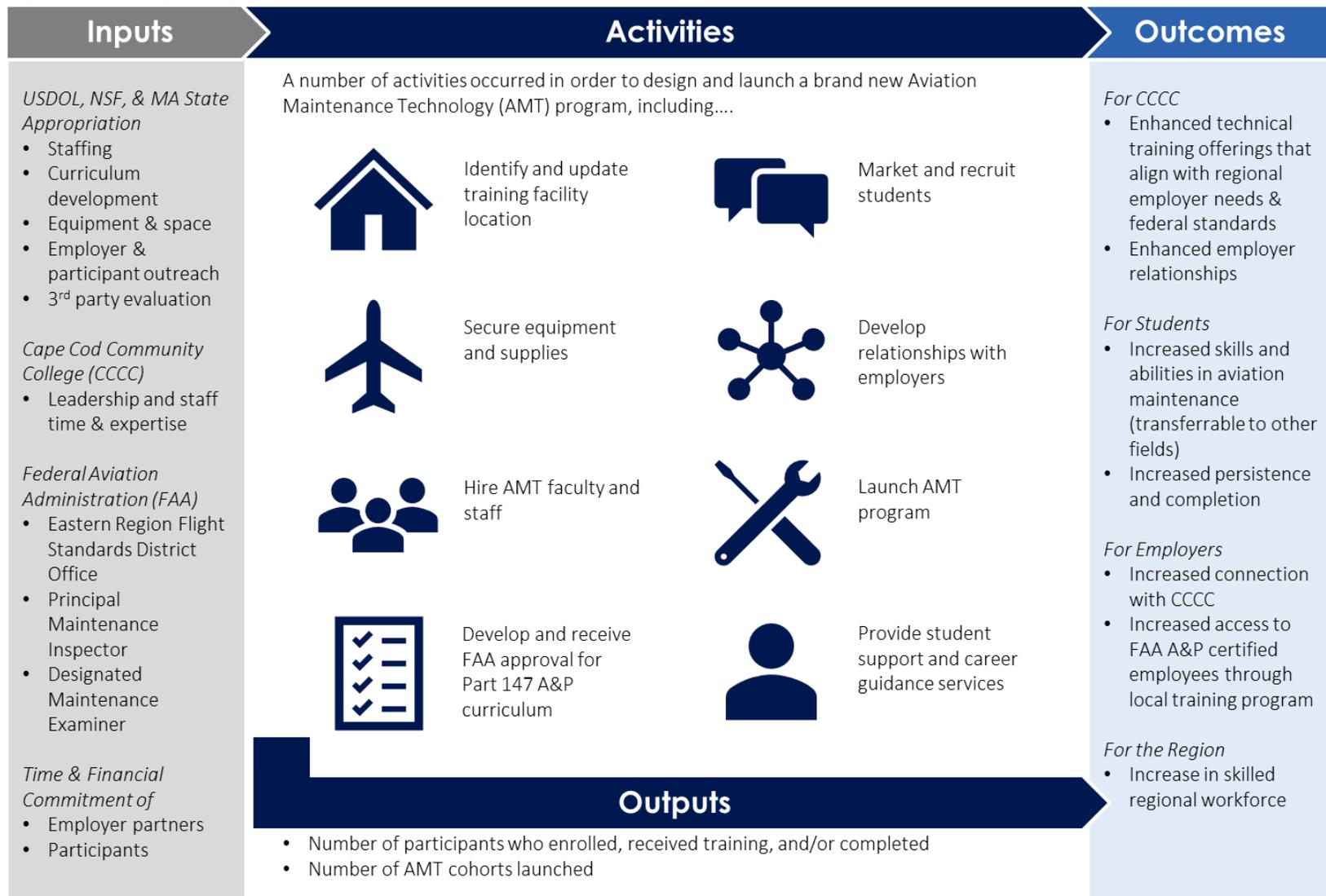
<sup>7</sup> Patton, M.Q. *Essentials of Utilization-focused Evaluation*. Thousand Oaks, CA. SAGE Publications, Inc., 2012.

<sup>8</sup> Thomas, D.R. (2006). *A general inductive approach for analyzing qualitative evaluation data*. *American Journal of Evaluation*, 27, 237-245.

## Logic Model

The logic model below highlights the vision for the AMT program, including (1) inputs and resources needed for the grant; (2) activities and work undertaken during grant implementation; (3) direct results from the activities (Outputs); and (4) anticipated changes for the college, participants, and partners (Outcomes). This program model was used to guide the evaluation.

Figure 3 | AMT Program Logic Model



# Implementation Evaluation

## Design Summary

The Implementation Evaluation began January 2015 and continued through May 2018 to document program progress, to monitor program outcomes, and to provide recommendations for continuous improvement of program operations. The Evaluation Team conducted a formative and summative evaluation, primarily focused on the development of the Aviation Maintenance Technology (AMT) program. Because the development and delivery of an off-site technical training program was an untested program design for CCCC, the Implementation Evaluation was intended to be a key element in simultaneously learning accelerators and barriers for the program while enhancing program implementation and outcomes. The Evaluation Team used the following primary themes when analyzing data for the Implementation Evaluation:<sup>9</sup>

- Progress toward achieving certain program outcomes or milestones
- Program accelerators, barriers, and environmental factors
- How strategies or activities not successfully implemented could be modified to the realities of the circumstances surrounding the project
- Context for sustaining certain project activities

To gather information on the themes above, the Evaluation Team collected data from the following sources:<sup>10</sup>

- Notes from implementation calls and ongoing communication
- In-person site visit interviews with key stakeholders including CCCC leadership, AMT staff and faculty, participants, and partners
- Student survey to gather additional participant feedback
- Student forms collected at intake, exit, and after program exit
- CCCC document reviews, including quarterly program reports, annual performance reports, program internal reports and documents, and promotional and descriptive materials

The Implementation Evaluation allowed the Evaluation Team, grant staff, and stakeholders to better understand the program's core activities and qualitatively evaluated how the operations of the AMT program functioned. This component of the overall evaluation placed the outcomes of the intervention into context with the implementation process and examined whether the program was implemented as designed. CCCC and AMT program staff/faculty could then use the results of the Implementation Evaluation to understand how the process might be modified to improve outcomes.

---

<sup>9</sup> For a description of analysis methods and a full listing of Implementation Evaluation research questions and the relationship between the research questions, data sources, and methods see *Appendix A*.

<sup>10</sup> *Appendix A* contains descriptions of each Implementation Evaluation data source and limitations to the evaluation. Triangulating results from these varying sources was used as an attempt to address the limitation of partial and biased findings.



## Research Questions

Key research questions that guided the Implementation Evaluation included:<sup>11</sup>

- 1.** *How was the particular curriculum selected, used, and/or created?*
- 2.** *How were programs and program designs improved or expanded using grant funds?*
  - a. *What delivery methods were offered?*
  - b. *What was the program administrative structure?*
  - c. *What support services and other services were offered?*
- 3.** *How were assessment tools used to select participants for the AMT grant program?*
  - a. *Was an in-depth assessment of participants' abilities, skills, and interests conducted to select participants into the grant program?*
  - b. *What assessment tools and processes were used?*
  - c. *Who conducted the assessment?*
  - d. *How were the assessment results used?*
  - e. *Were the assessment results useful in determining the appropriate program and course sequence for participants?*
  - f. *Was career guidance provided, and if so, through what methods?*
- 4.** *What contributions did each of the partners (i.e., employers, workforce system, other training providers and educators, philanthropic organizations, and others as applicable) make in terms of: (1) program design, (2) curriculum development, (3) recruitment, (4) training, (5) placement, (6) program management, (7) leveraging of resources, and (8) commitment to program sustainability?*
  - a. *What factors contributed to partners' involvement or lack of involvement in the program?*
  - b. *Which contributions from partners were most critical to the success of the grant program?*
  - c. *Which contributions from partners had less of an impact?*
- 5.** *What program outputs have been generated to date?*
  - a. *What barriers hindered output achievement?*
  - b. *What factors unexpectedly improved output achievement? Why?*
- 6.** *How satisfied were program partners, staff, and participants with the program? Why?*
- 7.** *What have been successes and obstacles to program performance?*
- 8.** *How can program processes, tools, and/or systems be modified to improve performance?*
- 9.** *How can the program expand or enhance institutional capacity?*
  - a. *What are the most promising programmatic components to use institution-wide? Why?*

These questions are referenced throughout the remainder of the Implementation Evaluation section.

---

<sup>11</sup> Research Questions 1-4 were required by USDOL. Research Questions 5-9 were added by the Evaluation Team.

## Findings Overview

Overall themes within the Implementation Evaluation findings include:<sup>12</sup>

### Program Start-Up

Conversations with local employers led CCCC to identify the FAA Aviation & Powerplant (A&P) certification as a regional need. Start-up of the new AMT program required the acquisition of a training facility with classroom and airplane hangar space, which was ultimately found at Plymouth Municipal Airport. Concurrent with finding a location, CCCC worked toward developing new curriculum, identifying and procuring new equipment and supplies, working with employers for equipment and supply donations, and continuing to build out the program by hiring AMT faculty and staff. An important component of the start-up process included collaboration with the FAA to approve the curriculum, equipment and materials, and space so that CCCC could become a FAA A&P Part 147 accredited training facility. With the volume of tasks and decisions that needed to be completed, especially the number of interdependent decisions that needed to be made (e.g. equipment based off the curriculum), the start-up phase required considerable staffing capacity.

An important element that accelerated CCCC moving from program start-up to program instruction was the dedication of AMT faculty and staff and CCCC leadership. Interviewed stakeholders highlighted an “all hands-on deck” approach where faculty, staff, and leadership were willing to take on significant additional responsibilities for the start-up of the program including curriculum development and procurement processes.

### Adaptation & Flexibility

Upon FAA approval, CCCC began offering AMT courses. This led to continuous improvement and refinement of the program. For example, the full-time, five-day per week schedule with multiple cohorts made it difficult for AMT faculty and staff to have time to prepare for courses, perform administrative work, and engage in professional development. The schedule also made it difficult for students to make up hours when they had to miss for personal reasons. Learning from this, CCCC shifted the AMT program to four-days a week, beginning with Cohort 3. Another unintended consequence of the program structure and site location included students facing challenges with accessing CCCC main campus resources, such as financial aid. As a result, AMT staff have brought main campus resources to the Plymouth AMT site, and they continue to focus on improving this area. These various examples of program shifts and continuous improvement highlight the adaptation and flexibility of CCCC, which will continue to be important as the AMT program is transitioning from grant funding to the college budget.

### Strengthening the College

As a result of the AMT program, CCCC leadership reported that the college strengthened its processes and approaches to grant implementation. Through AMT, CCCC further expanded the college’s offerings in the area of technical education. Due to its location in Plymouth, the AMT program expanded the college’s footprint beyond its traditional service area, with the ability to better draw from metropolitan areas such as Boston. Moreover, program faculty and staff have begun working on opportunities to enhance and leverage AMT programming and resources, such as a hybrid AMT program, an Avionics program, and customized employer training.

<sup>12</sup> Stages of the program were not purely sequential. For example, the General and Airframe curriculum were approved by the FAA and instruction for these began before Powerplant curriculum was approved.



## Program Development

Research Questions | 1, 2, 3, 4

The content within this section of findings focuses on research questions related to developing the AMT program, including curriculum selection, program design, participant skill assessments, and available career guidance and support.

### FAA A&P

Dialogues with employers led CCCC to identify the Federal Aviation Administration (FAA) certified Part 147 Aviation Maintenance Technology (AMT) program as an opportunity for a new technical program offered by the college. The FAA A&P certification is highly regulated by the FAA to ensure high-quality and consistent training across institutions. To align with FAA regulations, key components to developing this new AMT program included:

- Identifying and enhancing an aviation training facility,
- Acquiring equipment and supplies, and
- Developing curriculum that aligned with the requirements of the FAA.

### Training Facility

The AMT program required the acquisition of a training facility capable of accommodating classroom instruction as well as the execution of practical projects involving aircraft, engines, and other large pieces of equipment. Prior to the grant award, CCCC had received a \$1.95 million appropriation through the Massachusetts (MA) General Appropriation Act (GAA) in fiscal year 2015 for the purpose of securing a training facility for the AMT program. Upon grant award, CCCC identified two hangars at Barnstable Municipal Airport in Hyannis, MA and initiated discussions with the airport regarding the improvements necessary to meet FAA requirements. During this time, the Massachusetts Department of Capital Asset Management and Maintenance (DCAMM) completed an appraisal of the two hangars. DCAMM found that the price requested for the hangars was significantly higher than the appraised value. As a result, CCCC was unable to meet the asking price due to state procurement regulations. CCCC worked with DCAMM to execute a request for proposal (RFP) to locate a suitable training space for CCCC to lease. A total of six sites submitted bids for consideration in June 2015. Representatives from CCCC and DCAMM conducted site visits at each bidding location and performed a detailed review of each proposal.

In October 2015, a long-term lease was signed for a training facility at the Plymouth Municipal Airport in Plymouth, MA. Renovations began immediately, and a certificate of occupancy was granted in January 2016. In June 2016, the training facility was formally opened to the public in a ceremony featuring speeches by federal, state, and local elected officials, and representatives from industry and education. Although attainment of a suitable facility location took over a year longer than originally projected, the result was a state-of-the-art training space located 35 miles from CCCC's West Barnstable campus, establishing CCCC's first permanent footprint outside of their main campus and into the Greater Plymouth area. CCCC leadership anticipate that the Plymouth location will help the college draw more students from the Boston metropolitan area and across the state, with the goal of having the AMT program become a "destination program."





**Hangar 1** – Primarily contains equipment and supplies for the Airframe curriculum, with a focus on sheet metal, and includes faculty offices



**Hangar 2** – Contains equipment and supplies for Powerplant, including reciprocating engines for the flat motor curriculum, as well as the paint booth and welding lab



**Hangar 3** - Contains equipment and supplies for the turbine engine portion of the Powerplant curriculum, in addition to airplanes, instructor offices, and a classroom for the future Avionics program



**Classroom Space** - Computer classroom at the AMT Plymouth facility

## Equipment & Supplies

Since the AMT program was completely new to CCCC, a considerable amount of new equipment and supplies were required during program start-up. Over \$1 million in equipment and supplies were procured with Federal and State funds in order to execute the FAA Part 147 A&P training curriculum. The majority of these purchases took place via sealed bids, where the lowest bidder who met CCCC's requirements received the bid. These took an average of several weeks to two months per bid to complete. For equipment that involved the use of training simulators and virtual reality technologies, these custom orders took an average of four to six months to deliver following the bid award. In addition to bids and custom orders, CCCC also received donations for equipment and supplies from employer partners such as Cape Air (donated a Cessna 402C airplane), Pratt and Whitney (donated a V2500 TurboFan Engine), and Safe Flight (donated a Sabreliner 40 jet).

**"From a facilities and equipment standpoint, this place is blessed. This is the best-equipped school I've ever seen."**

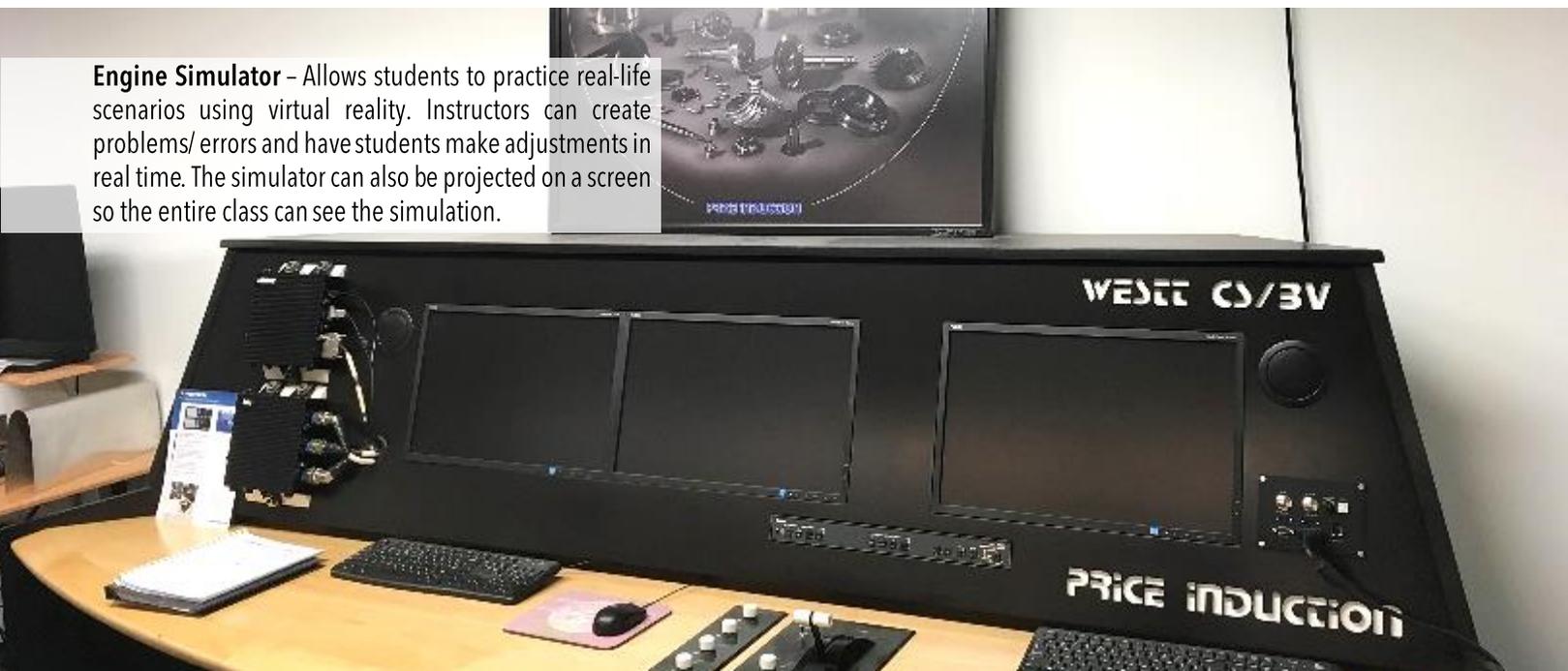
AMT Leadership

An important component of the FAA's approval process was that all the required equipment and supplies must be in place prior to FAA program certification. The acquisition of sufficient equipment and supplies to permit FAA approval and subsequently student enrollment took approximately two years to complete. The result of the equipment procurement and donations was a state-of-the-art training space containing three classrooms, including a computer classroom, faculty and conference space, and two large fully-equipped hangars for laboratory instruction that feature a welding booth, spray paint booth, several complete aircraft, aircraft simulation boards, virtual reality units, and a full repertoire of aircraft engines. Interviewed faculty and staff highlighted the importance of working in a high-quality facility, including the opportunity to have a computer classroom due to the considerable amount of electronic paperwork and high-tech nature of the aviation industry, which allowed for virtual reality training.

**"The image of a maintenance person with a greasy rag in their back pocket is passed, now the technician is well dressed and has a computer under their arm"**

AMT Faculty

**Engine Simulator** – Allows students to practice real-life scenarios using virtual reality. Instructors can create problems/ errors and have students make adjustments in real time. The simulator can also be projected on a screen so the entire class can see the simulation.





**Trainers** – Internal technical systems within an airplane are put on boards, so students can have easy access to hard-to-reach systems. Trainers can also be moved into the classroom for teaching demonstrations



**Fluid Lines & Fitness Trainer** – One of several large trainers illustrating various parts and correct assembly



**Snap-On Automated Tool Box** – A smart toolbox system that keeps an electronic record of who uses each tool including when the tool was checked out and when it was returned

## Curriculum Development

Like the process for acquiring equipment and materials, developing the curriculum required to offer a FAA certified Part 147 A&P training program took longer to complete than initially expected. As part of the FAA approval process, CCCC was required to provide the FAA with detailed theory instruction, lab instruction, and testing documents for over 40 topic areas. The FAA also needed to conduct site inspections of CCCC's facilities and equipment, as well as evaluate faculty through teaching demonstrations. In order to accomplish this, CCCC worked with the FAA Principal Maintenance Inspector (PMI) from the Eastern Region Flight Standards District Office (FSDO). The Eastern Region FSDO had not certified a Part 147 A&P training program in over two decades, so some of the approval steps took an extended time as processes between the two organizations were resolved. The incorporation of high-tech equipment such as simulation and virtual reality units also created the need for additional dialogue between CCCC and the FAA PMI because the equipment arrived after the FAA's first certification visit and thus had not been present in prior reviews of the AMT program.

CCCC's AMT Program Director began work on curriculum development once he was hired in Fall 2014. As full-time and part-time faculty were hired for the program, they also supported curriculum development, with a focus on the General and Airframe portions. Following the departure of the Program Director in Summer 2016, CCCC hired an aviation consulting firm, AeroTrain, to aid in the program's curriculum development. The consultants reviewed the General and Airframe materials, already developed by AMT faculty, and then focused primarily on assisting with the Powerplant curriculum. Curriculum for all three components of the FAA A&P certification – General, Aviation, and Powerplant – included a combination of classroom instruction with hands-on lab training, including simulator and virtual reality training components.

***“One thing I definitely commend the instructors on, most of us are here because we are not classroom people. When they take theory and apply it to something, like if we do hands on things then go over it, it makes so much more sense why I am here taking notes on this.”***

AMT Student

CCCC leadership reported that a productive relationship with the FAA was cultivated, and the college received FAA certification of the General and Airframe portion of the program in August 2016. This allowed for program enrollment to begin in September 2016. Additional curriculum development and equipment procurement occurred for the Powerplant portion of the program, which was certified by the FAA in April 2017. At that point, CCCC was a fully-certified FAA Part 147 A&P school, thereby allowing for full program operation and permitting the enrollment of multiple cohorts of students.

## AMT Program

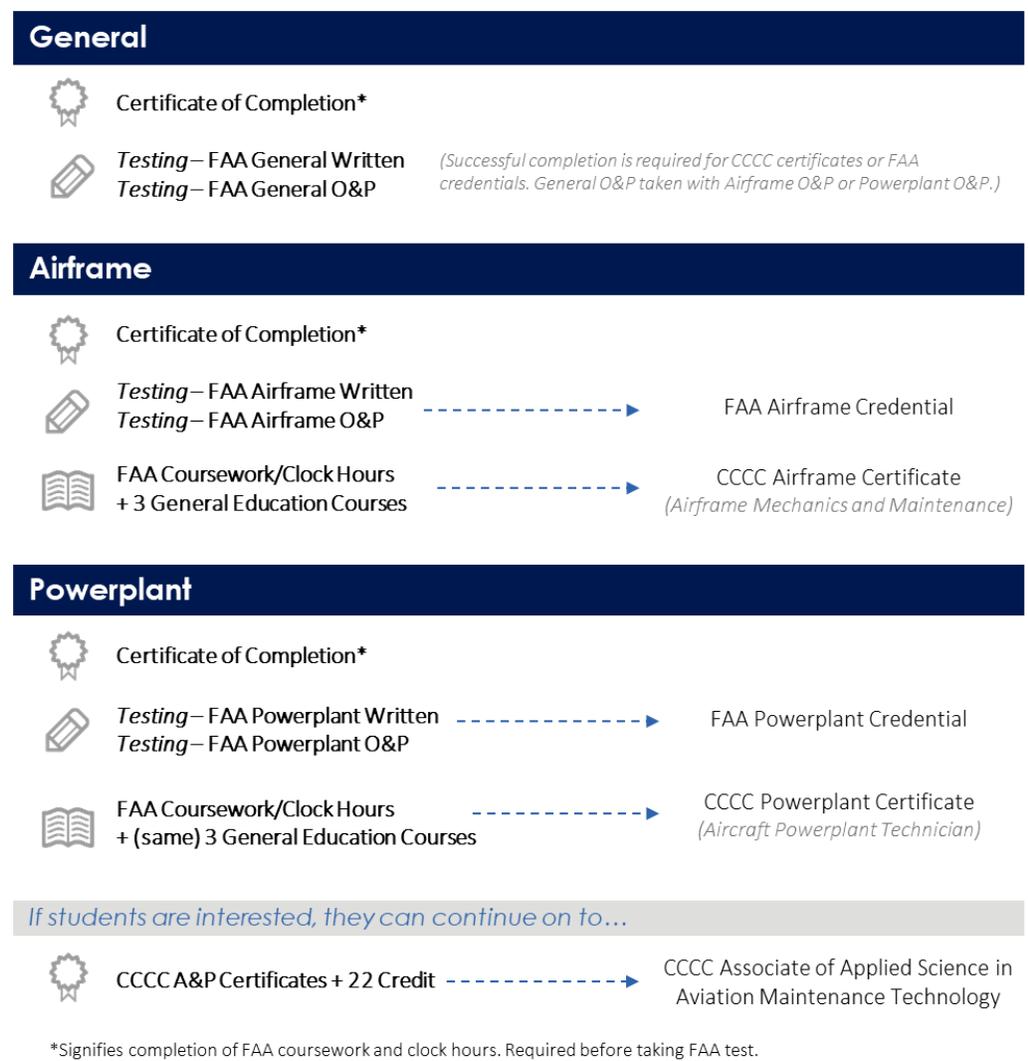
The AMT program is 1,904 hours of instruction and hands-on training. The program began on a 12-month schedule where students were engaged in training for five days a week at eight hours per day. By Cohort 3, the program was adjusted to a 15-month schedule where students went to school for four days a week at eight hours per day. Within the curriculum there are three program modules – General, Airframe, and Powerplant. Each module has two component courses (e.g. General I and General II). When combined, there are 47 topic areas covered across each course (e.g. basic electricity).



The AMT program is designed so that students who complete the program will be prepared to test for their Airframe and Powerplant (A&P) Certifications through the FAA. While obtaining these FAA credentials, there is also the opportunity to earn Certificates and an Associate of Applied Science (AAS) through CCCC by taking more general education courses. In addition, AMT students can continue on to pursue a bachelor’s degree. Articulation agreements with 4-year institutions have not yet been solidified, but CCCC is continuing to explore articulation opportunities as of the writing of this report.<sup>13</sup>

Components of the AMT program are shown in the chart below in the typical sequential order. FAA testing is optional, but strongly encouraged, and one attempt for each test (e.g. Airframe) is included in each student’s tuition. FAA testing can take place at any time after receiving the Certificate of Completion from CCCC, but faculty strongly recommend students take the FAA tests right after completion of the corresponding module.

Figure 4 | Organization of the AMT Program



<sup>13</sup> CCCC anticipated creating an articulation agreement with Bridgewater State University for their Bachelor of Science in Aviation Management. However, since applying for funding, Bridgewater State University shifted the focus of their aviation degree track such that it no longer aligned well with the CCCC AMT program (i.e. more flight-focused than maintenance-focused). CCCC is continuing to explore avenues for articulation agreements with 4-year institutions.

The AMT program at CCCC is housed under the Dean of Science, Technology, Mathematics, Business and Workforce Education, with the AMT Program Director reporting directly to the Dean. Full-time and part-time AMT faculty, and AMT staff reported to the AMT Program Director (or to the Dean in the Program Director's absence). In addition to AMT staffing, CCCC's Grant Compliance and Research Analyst was also heavily involved in managing the grant reporting, data collection approaches, and collaboration with the Evaluation Team. The Grant Compliance and Research Analyst reported to the Director of Grants, with both the Director and Dean reporting to the Vice President of Academic and Student Affairs.<sup>14</sup>

Once students completed the AMT program, AMT faculty and staff hosted a pinning ceremony for the graduates. This included a pin specially designed for AMT and a celebration of the student's accomplishments in the program.

## **Student Services**

### **Student Recruitment**

To help students better understand what the AMT program will include, CCCC organized a variety of information-focused events to highlight AMT and key components of the program. For example, in October of 2015, CCCC held a Tech Expo to highlight the AMT program and other STEM programs at the college. This was the first exposition event the college had conducted. The Tech Expo brought in students, teachers, and members of the general public. Approximately 20 students that attended the Tech Expo participated in a follow-up meeting to learn more about the AMT program.

As a part of recruitment, students were strongly encouraged to attend an Information Session prior to enrollment. These were done in conjunction with the CCCC Admissions Office. In addition, as CCCC identified gaps in student services, the college made staffing changes to further support AMT recruitment efforts. This included hiring a staff member dedicated to AMT program recruitment (AMT Recruitment Counselor) as well as more direct involvement from other college admissions staff to increase the breath of coverage about the program.

### **Student Intake**

Before a student could enroll in the AMT program, he/she was tested using ACCUPLACER to identify the student's general knowledge and proficiency in math, reading comprehension, and sentence skills. Students who did not meet the minimum testing standard were directed toward developmental education courses or another resource (e.g. online tutorials, workshops) to prepare potential students on AMT entry-level skill requirements before they were admitted into the AMT program.

Once enrolled, students participated in AMT Program Orientation. This was a full-day event that took place at the AMT hangars a few weeks before classes started. All students who were enrolled in the program were required to attend. During orientation, students were given a tour of the facilities, an overview about the program, and a student handbook that they read and agreed to the policies within.

In addition, the Student Retention Specialist and later the Student Success Coach would meet individually with the student to complete an Initial Individual Services Plan, which included feedback around how the individual heard about the program and what interested them most in AMT.

---

<sup>14</sup> Upon the departure of the Dean of Science, Technology, Math and Business in 2017, the AMT Program Director reported directly to the Vice President of Academic and Student Affairs while the search for a new Dean was conducted.

## Accessibility to Main Campus Resources

Students, faculty, and staff reported that the full-time off-campus nature of the AMT program made it difficult for students to access school resources that were available on the main campus (e.g. student IDs, student organizational groups, the library, the Financial Aid Office, the Bookstore). The Student Retention Specialist would often take on the role of intermediary between AMT students and on-campus resources as the students were often not able to visit campus, or experienced difficulty receiving a response from those resources when they contacted them. When the Student Success Coach, who was hired to replace the previous Student Retention Specialist, began in February 2018, she worked with main campus entities such as the Bookstore, the Financial Aid Office, the Career Planning Office, and the Crisis and Life Management (CALM) Team to bring these services to the AMT Plymouth location.

## Student Progress Tracking

Once FAA approval was received, the Student Retention Specialist worked with AMT faculty and staff to develop student retention and completion procedures, including a weekly census reporting tool where student progress was tracked. Progress included FAA hours attended, missed and made-up, and test scores. The Student Retention Specialist used this tool during one-on-one meetings with students to review academic progress and career planning. In 2018 when the Student Success Coach was hired, she modified the existing student progress tracking system and scheduled regular one-on-one meetings that were primarily geared in content and timing around student milestone events such as orientation, module transition, and employment. These included mandatory advising meetings prior to registration for each subsequent program module (e.g. transition from General to Airframe). The Student Success Coach also met with students about career-focused topics at the end of Airframe and throughout the Powerplant module, with additional meetings scheduled as needed. (e.g. transition from General to Airframe). Early check-ins with the Student Success Coach focused on program enrollment and next steps within the AMT program (e.g. registration for Airframe).

## Career Guidance & Student Support

Once the AMT program components were developed, the Student Retention Specialist incorporated customized career guidance and support strategies into the AMT program. For example, a Career Development Workshop and a Portfolio Building Workshop were included in the General and Airframe modules for Cohort 1. For Cohorts 3 and 4, two Peer Tutors from Cohort 3 were trained by CCCC to provide in-person support and tutoring for their fellow AMT classmates. The AMT program aligned with the CCCC main campus in having student officers. They represented the interests of the AMT students, which included asking questions and giving voice to challenges or concerns faced by AMT students. In addition, the Student Retention Specialist and Student Success Coach both worked from the AMT hangars in Plymouth and were available for individualized student support, as needed.

**“There were a lot of hoops, but [the Student Retention Specialist] jumped through them [for me].”**

AMT Student

Career support was also provided by connecting students with employers. For example, in 2017 and 2018 the AMT program hosted a job fair in the Plymouth hangar, bringing together AMT students and employers. Throughout grant implementation, the program invited employers to speak with the students, sharing information about the industry and their companies.



## Program Progress

Research Questions | 4, 5, 6, 7, 8

The content within this section of findings focuses on the research questions related to program implementation. These results highlight overall grant rollout, successes, barriers, and program outputs.

The graphic on the following page includes key implementation areas, highlighting progress and shifts to the implementation approach made during the grant period. At a high-level, these areas of implementation included:

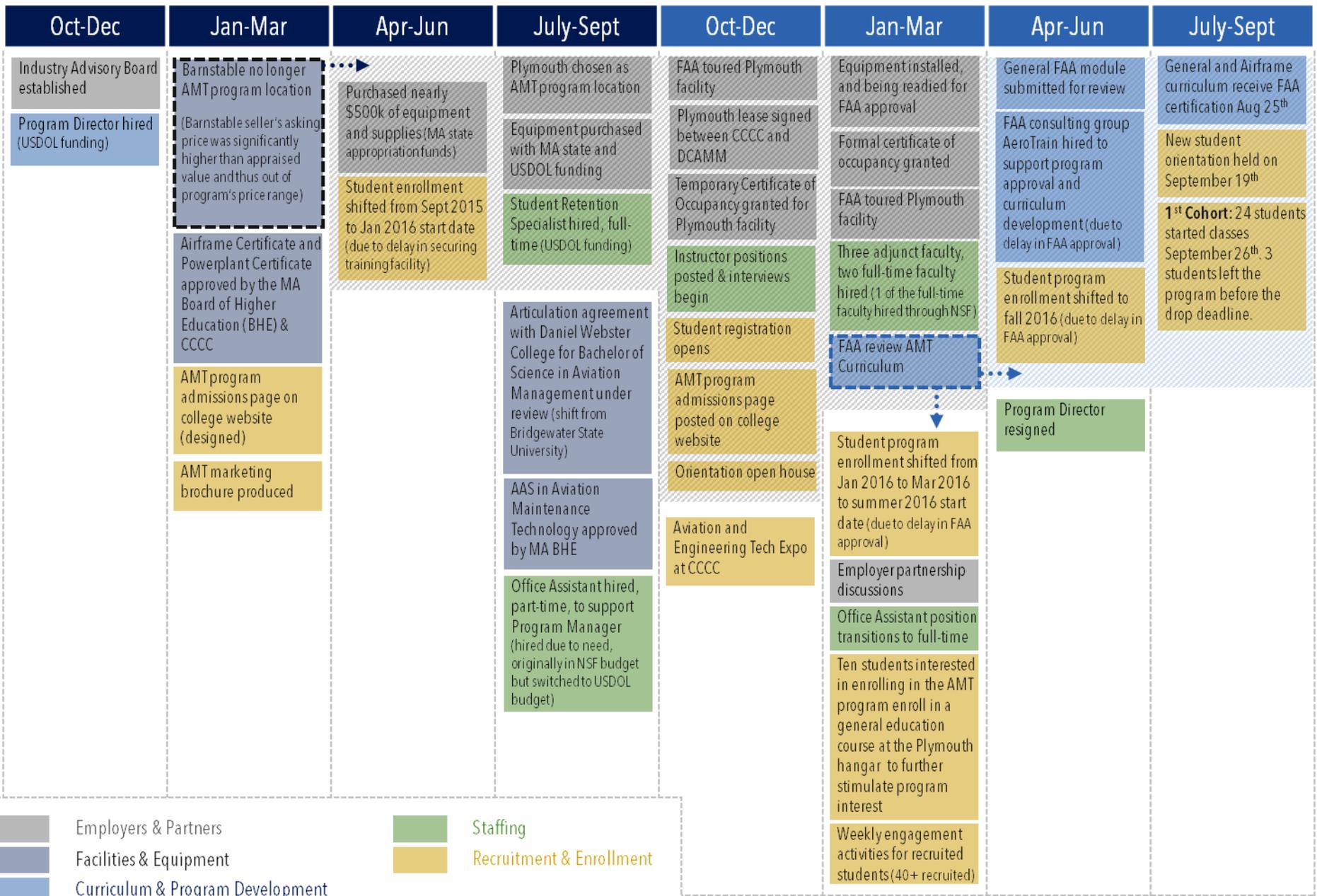
- Engaging employers and community partners
- Establishing an AMT building facility with equipment and supplies
- Developing the AMT program and curriculum, including developing content for General, Airframe, and Powerplant modules and working with the FAA toward A&P Part 147 certification
- Hiring AMT program personnel including full-time faculty, part-time faculty, and staff
- Recruiting and enrolling students



Figure 5 | Implementation Milestones

PY1 (Oct 1, 2014 – Sept 30, 2015)

PY2 (Oct 1, 2015 – Sept 30, 2016)



- Employers & Partners
- Facilities & Equipment
- Curriculum & Program Development
- Staffing
- Recruitment & Enrollment

PY3 (Oct 1, 2016 – Sept 30, 2017)

PY4 (Oct 1, 2017 – Mar 31, 2018)

Oct-Dec	Jan-Mar	Apr-Jun	July-Sept	Oct-Dec	Jan-Mar
<p>Runnable turbine engine for Powerplant curriculum put out to bid (bid closed Dec 6<sup>th</sup>)</p>	<p>Donated airplane with runnable turbine engine arrives (Feb 6<sup>th</sup>)</p> <p>Additional full-time faculty member and two adjunct faculty members are hired</p>	<p>Powerplant curriculum receives FAA certification, and the AMT program is fully FAA Accredited</p> <p><b>1<sup>st</sup> Cohort:</b> Starts Powerplant curriculum in May</p>	<p>AMT program shifts back to 5 days per week after Labor Day</p> <p>All new AMT cohorts will be on 15 month, 4 days per week schedule</p> <p>AMT hybrid program internal CCCC team begins meeting to review FAA 8900 order guidance and Learning Management System requirements</p>	<p>Faculty search for 2 new full-time faculty begins</p> <p>Two full-time and two part-time faculty hired</p> <p>Student Retention Specialist resigned</p> <p>CCCC incorporated portions of Student Retention Specialist position into college positions</p> <p><b>1<sup>st</sup> Cohort:</b> Graduates in October –</p> <ul style="list-style-type: none"> <li>• 20 completed FAA hours for Airframe and 16 for Powerplant;</li> <li>• 10 earned CCCC certificates in Airframe and 9 in Powerplant</li> <li>• 9 received FAA certification</li> </ul>	<p>Student Success Coach hired in February</p> <p>AMT Recruitment Counselor hired in March</p> <p>By March 31<sup>st</sup> all USDOL-funded positions have transitioned to college funding</p> <p><b>4<sup>th</sup> Cohort:</b> Starts in January</p> <p>Preparation for May 2018 Career Fair</p>
<p>New Program Director started Oct 19<sup>th</sup></p> <p><b>1<sup>st</sup> Cohort:</b> Completes General curriculum module</p> <p>NASA funding will cover the tuition for students in Cohort 1 for General and Airframe (funding to begin in December)</p>	<p>Additional grant purchasing completed by March 31<sup>st</sup></p> <p>NASA funding will cover the tuition for students in Cohort 2 for General</p> <p><b>1<sup>st</sup> Cohort:</b> Starts Airframe curriculum in January</p> <p><b>2<sup>nd</sup> Cohort:</b> Students start AMT training Jan 23<sup>rd</sup></p> <p>CCCC joined TAACCCT Sustainability Institute</p>	<p>AMT program shifts to 4 days per week over the summer</p> <p>NEASC site visit conducted at the AMT hangar (week of April 10<sup>th</sup>)</p> <p>Discussions with Cape Air to create an internship program for AMT students who have completed their aviation training</p> <p>AMT Program Advisory Board re-engaged via formal group meeting with airlines including Southwest Airlines, Cape Air, and Delta Airlines</p> <p>NASA funding will cover the tuition for students in Cohort 2 for Airframe</p> <p>Decision made to not start a new cohort in May</p> <p><b>2<sup>nd</sup> Cohort:</b> Starts Airframe curriculum</p>	<p>1<sup>st</sup> AMT Career Fair with 12 companies and 250+ job openings in July</p> <p><b>2<sup>nd</sup> Cohort:</b> Starts Powerplant curriculum</p> <p><b>3<sup>rd</sup> Cohort:</b> 20 students start AMT training on Sept 5<sup>th</sup></p> <p>USDOL Federal Project Officer monitoring site visit (week of Sept 4<sup>th</sup>)</p> <p>AMT presentation at USDOL TAACCCT convening in Washington, DC (Sept 25-27)</p>	<p><b>1<sup>st</sup> Cohort:</b> Graduates in October –</p> <ul style="list-style-type: none"> <li>• 20 completed FAA hours for Airframe and 16 for Powerplant;</li> <li>• 10 earned CCCC certificates in Airframe and 9 in Powerplant</li> <li>• 9 received FAA certification</li> </ul>	

	Employers & Partners		Staffing
	Facilities & Equipment		Recruitment & Enrollment
	Curriculum & Program Development		

## Accelerators & Strengths

The AMT program leveraged a number of strengths, positioning it for ongoing success and sustainability. Among the greatest of these strengths include:

### AMT Facility, Equipment, & Location

Both program staff with previous experience in aviation maintenance programs and corporate partners stated that the facility, equipment, and materials for the program were state-of-the-art. USDOL funding and Massachusetts state appropriation funding enabled the program to purchase certain types of tools and equipment that stakeholders reported were not present at many training facilities. Examples of these included training boards and simulation systems such as a landing gear simulator, a turbocharged fuel injection trainer, and PT-6 turbine engine systems that allowed students to interact with the equipment, including visible illustrations of various parts and examples of correct and incorrect assembly.

The location of the hangar in Plymouth was also seen as a strength to help the college attract more students from Boston and other surrounding areas. After a full-time AMT Recruitment Counselor was hired in April of 2018, program marketing and efforts to recruit students outside of CCCC's traditional service area are anticipated to increase.

Another benefit of the Plymouth location was that students were able to take their FAA certification tests at the same place where they took their classes. The computer portion could be taken at the testing center at the Plymouth airport, and there was at least one FAA-Designated Mechanic Examiner (DME) based at the Plymouth airport for the Oral and Practical examinations. This was beneficial for students who already commute several hours to the Plymouth facility for class, as these tests can often last eight to twelve hours.

**"The students have the opportunity to really get their hands on a lot of brand-new, state-of-the-art training equipment to make them even better mechanics."**

Employer



**Airplane Cockpit** – Students work on internal and external aircraft repairs



**Entrance Sign** – Sign at the AMT hangar in Plymouth



**Solid State Ground Power Unit** – Allows an airplane to be powered without the need to start the engines. One of the final equipment purchases made with USDOL funds in March 2017



**PT-6 Engines** – Part of the Powerplant curriculum and allows students to practice a hot section inspection

**Multiple Practice Engines** – Multiple engine stations allow students to practice assembly and disassembly of airplane engines





**Paint Booth** - The booth is pressurized so air pushes out as the door opens. This design allows external particles to remain outside the paint booth. Inside the booth is an air filtration system, which captures and relocates the paint spray particles outside of the building



**AMT Faculty** - Assessing student work



**Paint Booth** - Multiple work stations

## In-Demand Training

Staff, faculty, employers, and students reported that the AMT program offered training for in-demand jobs. Student opportunities across a variety of aviation fields were identified by these stakeholders, including general aviation maintenance at smaller shops around Plymouth, to working at regional, national, or international airlines in more specialized positions. In addition to the demand for these skills in the airline industry, the FAA credentials enabled students to work in other industries, including renewable energy (e.g. windmills), elevators, and trains, among others. Because of the demand for this type of program in the region, the availability of well-paying jobs, and the lack of similar programs, CCCC sees potential to draw from students within the region.

There are only a few other community colleges in the United States that offer the FAA A&P Certification training at an accelerated pace, allowing a student to graduate with A&P Credentials in 12-15 months. CCCC is the only public institution of higher education offering this accelerated certification in the New England region. CCCC leadership and AMT faculty and staff noted that the FAA aims to increase the FAA certification exam success rates of students for the region. Stakeholders shared that the lower pass rates might be due to other facilities having older equipment and not being current with the advanced aviation technology used in the industry. The opportunity for this AMT program to provide training that adequately prepares students so that they pass the FAA exams at higher rates than others in the region could create further demand for the program.

**“We’re hiring a lot of A&P’s. There’s a lot of demand. The baby boomers are retiring, and people aren’t there to back-fill.”**

Employer

**“How do students find employment? They don’t, it finds them. The opportunities are so great, they can choose where they want to live [and work].”**

AMT Leadership

**“I guarantee everybody in this program, if they get [FAA] certified, they’ll get a job. I’m seeing this from my classmates.”**

Cohort 1 Student

## Employer Commitment & Engagement

The AMT program was intentional in seeking out industry support and insight for program. Prior to the start of the AMT program, CCCC had minimal contact with individuals within the aviation industry, apart from a relationship with Dan Wolf, the owner of Cape Air, and Dave Bushy, board member of Cape Air and Jet Blue. To build connections, the first Program Director spent time meeting with industry personnel, visiting local airports, and building relationships with local companies including Pro Air and Alpha One.

During the grant, CCCC and AMT leadership worked with approximately 10 airlines who served on the Advisory Committee for the AMT program. These included large airlines such as United and Jet Blue, regional airlines like Cape Air, and smaller companies like Pro Air and Alpha One that do private flights. In addition to the Advisory Committee meetings, AMT faculty and staff had one-on-one meetings with corporate partners, continuing to strengthen these relationships. Through Advisory Committee and



individual meetings, CCCC and AMT leadership and faculty reported learning key insights into the industry, such as the high demand for avionics training by employers. In addition, CCCC leadership reported learning that the student internship portion, originally envisioned in the NSF application, was not valued by employers until after the student had completed the Airframe portion of the AMT program and passed the FAA Airframe Credential. As a result, CCCC shifted NSF funding from student internships to student scholarships, to help support the cost of training.

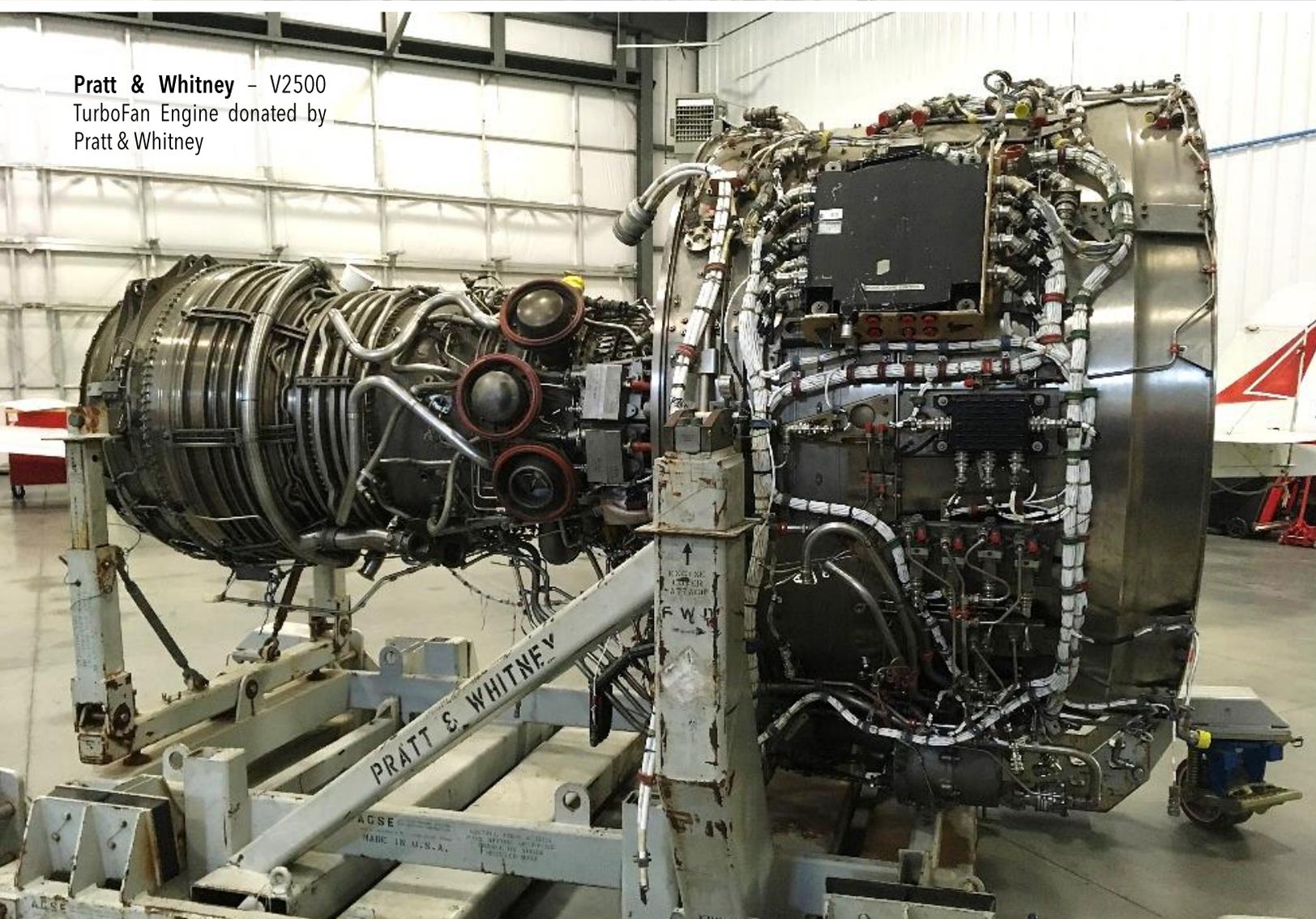
Employers, particularly Cape Air, were engaged in the development of the training program, and multiple employers provided material support to start the AMT program. For example, Cape Air donated an airplane from their fleet and Pratt and Whitney donated a V2500 TurboFan Engine. In 2017, when the AMT program needed a runnable turbine engine for the Powerplant curriculum, Safe Flight donated a Sabreliner 40 jet, complete with an operational turbine engine, to the college. Interviewed employers identified a need for certified A&P mechanics to work on their fleets. As such, they saw value in having students trained on similar planes and parts as that the mechanics they hire.



**Cape Air** - Cessna 402C 9-passenger plane donated by Cape Air



**Safe Flight** - The Sabreliner 40 jet was donated by Safe Flight Instrument Corporation, fulfilling the requirement of having a runnable turbine engine for the Powerplant curriculum



**Pratt & Whitney** - V2500 TurboFan Engine donated by Pratt & Whitney

Throughout the grant period, a variety of employers expressed interest in the AMT program and the program's graduates. Representatives from Delta Tech Ops met with students to share about A&P opportunities within their company. Alpha One, a local general aviation shop and flight school, expressed interest in hiring future graduates, as well as continuing engagement with the AMT program and staff. In interviews with the Evaluation Team, Cape Air expressed a willingness to provide training and expertise to faculty and staff at CCCC, and an interest in being in AMT classrooms to provide instruction, share industry-relevant experience, and discuss employment opportunities at Cape Air to students.

**"I think the greatest success is the incredible support of our legislative delegation, people in the industry, and various ancillary industries have been incredibly supportive. Major carriers' willingness to be on the advisory board – informs us on curriculum and what needs are."**

CCCC Leadership

### CCCC Leadership Buy-In

The AMT program had strong buy-in from leadership at the college. CCCC leadership were approached by local airlines who identified the need for A&P certification training in the region. Responding to the need, CCCC leadership were instrumental in pursuing various funding streams to make the development of the program feasible. This gave the college not only the funding, but the flexibility in how funds could be spent to establish the program.

During program start-up, AMT program leadership and CCCC leadership began discussing the program's long-term sustainability. CCCC had plans for funding the replacement of equipment through the school's operating budget. CCCC also collaborated with Jennifer Freeman of Jobs for the Future, who was contracted through USDOL in a sustainability initiative focused on TAACCCT Round 4 grantees. This collaboration included calls and a site visit to look at similar AMT-type programs across the nation and their promising practices, and work towards program sustainability.

The commitment of CCCC leadership was also instrumental in ensuring the program continued to move forward during staffing adjustments and changes. For example, the Dean of Science, Technology, Mathematics, Business and Workforce Education took on many of the AMT Program Director responsibilities during the interim period between the two directors. Later in the program, after the current AMT Program Director was hired, the Dean of Science, Technology, Mathematics, Business and Workforce Education left the college. During the transition between Deans, the Vice President of Academic and Student Affairs took on West Barnstable Campus leadership for the program until a new Dean was hired. Additionally, CCCC and AMT staff assumed additional responsibilities for the AMT program during administrative and operational staffing transitions at the college, such as handling AMT procurement during staff changes in the Financial Office.

### Dedicated AMT Faculty & Staff

One consistent theme throughout AMT faculty and staff interviews was the strong support for and dedication to the AMT program. AMT program faculty and staff reported giving extra time and resources to the program because they believe this AMT program was essential for the region and could make a significant difference in the lives of the AMT students. For example, AMT faculty spent extra time with students during the evenings and on Saturdays to help them make up seat time and/or better understand concepts taught in that week's lessons.



Faculty and staff also demonstrated a willingness to unite in supporting program start-up initiatives. As an example, when the Program Director stepped down, full-time and part-time faculty were quick to take on responsibility for curriculum development. Faculty divided the curriculum up amongst themselves based on their interests and expertise to finish development, especially for the Powerplant curriculum, while also teaching current students.

**“The people who are in place now – the faculty and staff – definitely have a really sound handle on the nature of the industry.”**

CCCC Leadership

**“I wanted to give back, so I started teaching.”**

AMT Faculty

**“The teachers are great. They’re always around to help you. If you don’t understand anything, they’re always available.”**

AMT Student

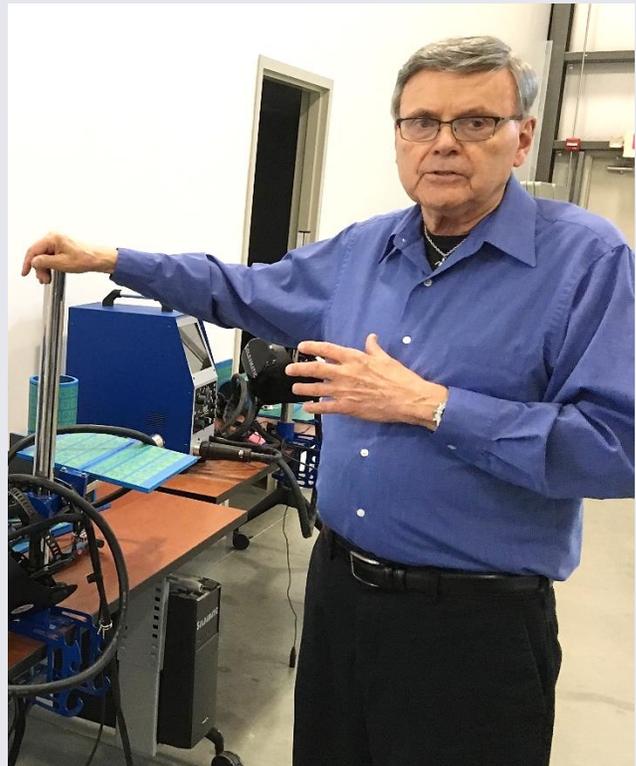
## Charles Taylor Master Mechanic Award

CCCC has been able to recruit instructors who are dedicated to the aviation industry and bring with them years of industry experience in the military, airlines, and/or through their own aviation businesses. An example of dedication to the aviation industry can be seen through full-time faculty member Robert (Bob) Nelson, who was awarded the Charles Taylor Master Mechanic Award in March 2017.

The Charles Taylor Master Mechanic Award was created in honor of Charles Taylor, who was the first aviation mechanic in powered flight. He served as the Wright brothers' mechanic and is credited with designing and building the engine for their first successful aircraft. The Charles Taylor Master Mechanic Award recognizes the lifetime accomplishments of senior mechanics who are FAA or Civil Aviation Authority certified and have 50 or more years of civil and military maintenance experience.

**“Bob was very high up in aviation. He’s worked in a variety of companies and owned his own, and this is his way of giving back.”**

CCCC Leadership



## Staff & Faculty Professional Development

Throughout the grant, CCCC provided a variety of training and professional development opportunities to the AMT program's faculty and staff. These training opportunities included bringing CCCC main campus staff to the AMT Plymouth location to offer training traditionally available on the main campus. This training consisted of topics such as Classroom Civility, Integrated Teaching, and Microsoft Excel. In Spring 2017, after the new Program Director and additional faculty had been hired, a CCCC staff member who focuses on professional development, in collaboration with AMT faculty and staff, developed a plan for professional development in the areas of classroom management and STEM interactive learning strategies. The main goal these professional development events were to help AMT faculty learn methods to effectively communicate their AMT technical skills and knowledge in a college classroom setting. Customized training from main campus staff continued to be offered on an as-needed basis as topic areas of interest were identified, after the initial professional development training plan was completed.

AMT program personnel also visited the main campus for trainings, which included closing the hangar so faculty and staff could attend CCCC's college-wide professional development training (Professional Day) in May 2018. With the help of NSF funding, AMT faculty had the opportunity for industry-specific training, including attending the Aviation Technician Education Council (ATEC) Annual Conference in 2017 and Nida Electrical and Electronic Systems Training. Faculty also had access to program-specific training including Quality Matters courses for developing online curriculum. Moreover, AMT staff have pursued training such as Mental Health First Aid and have attend the 2018 Massachusetts Teaching, Learning and Student Development Conference. In addition, USDOL funding and technical assistance have provided opportunities for continued learning through webinars and in-person TAACCCT convenings. Through these professional development opportunities, CCCC has been able to invest in AMT personnel and build capacity for the AMT program, which should continue to strengthen the program beyond the grant.

## Streamlined Points of Contact

Interviewed stakeholders – students, staff, faculty, and leadership – consistently found value in having streamlined points of contact. Students reported that having a single point of contact for student support (i.e. the Student Retention Specialist) provided them with an easier way to connect to CCCC's services and to learn more about and enroll in the AMT program. Due to being off-site and to the time-intensive nature of the accelerated program, students reported having difficulty going to the main campus to access resources. They shared that the Student Retention Specialist was instrumental in helping students contact Financial Aid and other resources, handling other types of communication, and making sure that AMT program students were getting the support they need.

Staff and leadership especially valued having an individual (i.e. Grants Compliance and Research Analyst) understand funding streams (e.g. USDOL TAACCCT, NSF ATE, and Massachusetts State Appropriation) and CCCC systems. This allowed for more efficient reporting and better management of grant-related data and information.

**“Having one point person here handle everything has been great. [The Student Retention Specialist] has been really helpful.”**

AMT Student



## Adaptation & Flexibility of CCCC

The college has worked through a number of challenges and delays in developing and starting the program. However, through leadership, staff, and faculty engagement, CCCC was able to continue adjusting and progressing with the AMT program. CCCC worked through changes in program location, delays in curriculum development, turnover of key staff, and navigating the process of securing FAA approval for the program's curriculum.

One of the key factors that enabled the AMT program to move past these challenges and start courses in September 2016 was the willingness of CCCC staff and faculty to be "all hands on deck." For example, staff not originally hired to focus on the program stepped in to take significant responsibility for the start-up of the program. In particular, staff members became engaged and worked collaboratively in the area of procurement, a very involved process that can take three to four months for bid requests and Board approval, followed by several months for purchased materials to be delivered.

Another theme around flexibility was the focus on continuous improvement. After FAA approval was received, CCCC leadership chose to delay the start of the third AMT cohort to allow for learning and improvement time. Faculty reported the need for more time to make adjustments to curriculum and reduce student "down time." Furthermore, college leadership wanted to incorporate input from third parties to improve the program (e.g. Chinese Aviation Group, NEASC site visit).

**"During the first year and first cohort there was a vertical learning curve. The students learned a lot and so did we."**

AMT Faculty

As a result, during the Summer 2017, the AMT program shifted to a four-day schedule. The program used this shortened schedule as an opportunity for providing staff professional development and for reviewing and strengthening curriculum and program delivery. Faculty and staff reported appreciating and valuing the four-day schedule, which allowed for increased collaboration and cross-training for faculty as well as professional development trainings on-site at the AMT Plymouth location. The shift from five- to four-days was made permanent for future cohorts, including Cohorts 3 and 4. This change extended the program from 12 to 15 months.

In addition, as CCCC recognized the need for increased AMT capacity, the college hired additional staffing support, including full-time and part-time faculty, the AMT Recruitment Counselor, and the AMT Hangar Manager. As described in the *Student Services* section, the AMT Recruitment Counselor allowed the college to have a dedicated staff member for AMT recruitment, considerably increasing program marketing efforts. Additional faculty allowed the program to continue adding new cohorts, refining course content, and providing make-up support for students who missed class. With multiple concurrent cohorts, AMT faculty and staff recognized the need for increased structure and organization in the AMT hangars. CCCC hired the AMT Hangar Manager to allow faculty to focus on teaching while the Hangar Manager provided the administrative and organizational support needed to keep track of all equipment and supplies, including ordering new supplies when materials were used up or missing.



**“It’s really about stepping back, making sure we know where we are, we know what we need to do, and making sure we are at the right place to proceed.”**

CCCC Leadership

Continuing with the theme of ongoing learning and program improvements, CCCC anticipates submitting a request to the FAA in Fall 2018 for an increase in total instructional hours by January 2019, increasing the total hours from just above the FAA minimum at 1,904 to approximately 2,000 hours. This change would build in more time for possible disruptions in student schedules, such as snow days or sick days. In addition to building in flexibility to the schedule, CCCC is also interested in adjusting course content hours to allow for increased time in subject areas where students have needed extra training, such as basic electricity, and a decrease in hours for subjects that have been easier for students to master, such as propellers.

**“If we miss a day, we have to shift the schedule to the right... Upping the hours above 1900 gives us flexibility. So as long as we prove we’ve covered the required topics, we don’t have to make up the hours.”**

AMT Leadership

## **Challenges & Barriers**

All new programs experience challenges and changes to plans. In establishing the AMT program, CCCC encountered and overcame a number of barriers, including the following:

*Start-up related challenges included...*

### **Capacity Needed to Start a New Program [Start-up]**

The AMT program needed additional capacity to start-up the program beyond that funded by the grant and pulled in other college staff and faculty. The start-up process also has required significant time and attention from the leadership at CCCC. Since CCCC had not started a program like this before, the college did not have a clear sense of how intense and time consuming it would be. For most of Year 1, the AMT program only had one staff funded by the grant, the Program Director. Then in the last quarter of Year 1, the Student Retention Specialist and a part-time Office Assistant were hired. The identification of a location for the program, the procurement process, and development and approval of the program’s curriculum all took longer than anticipated and required significantly more capacity. The college realized this was not adequate for the undertaking of all the work required to start the program, and therefore the Grant Compliance and Research Analyst, who was hired in-part to support this grant initiative, maintained a heavily engaged role throughout the grant.

In addition, once hired, faculty capacity was primarily used to support curriculum development because FAA approval of the curriculum was the most pressing need. However, in looking back faculty recommended having enough faculty capacity to engage them in equipment purchasing decisions and to provide the opportunity for faculty to test out teaching the curriculum before students were in the classroom. Faculty and staff reported that spending extra time on the equipment choices on the front end could have helped the program purchase enough of the equipment it needed (e.g. multiple pieces of the same equipment so more than one student could practice at a time) and purchase the most industry-relevant equipment.



**“With the facility in place, [starting up the program takes] about a year. The biggest thing is going through the curriculum and making sure you have all requirements.... As you build your curriculum, you are saying, ok we need this gear.... Then, even if you realize you need this piece of gear, it might be a 5-6 month delay before it is delivered.”**

AMT Faculty

The need for more capacity was also seen when the AMT program offered A&P courses for the first time. For AMT faculty, completing the Powerplant curriculum and learning the approved General and Airframe curriculum while also teaching two cohorts and completing the administrative tasks their positions require, was especially difficult. AMT staff capacity was also stretched by the need to track and support student needs, often serving as a liaison between students and the resources they need to access from the main campus. After CCCC was approved by the FAA to offer Powerplant and when the teaching schedule shifted to four-days a week, faculty and staff reported having more time for preparation, collaboration, and professional development.

**“It’s a huge, huge undertaking to do a program like this.”**

CCCC Leadership

### Change in Program Location [Start-up]

The initial location chosen to house the AMT program was not feasible due to a significant gap in the asking price compared to the appraised value. CCCC had to start over in the search for a location, requiring a bidding process and delaying the decision on program location for several months. The change in location was the first of several delays that resulted in pushing back the start date for students. Although this was a challenge to starting the program, the new site was more suitable for the program. Staff and faculty stated that the new location for the program at Plymouth was a better fit, and more compelling for recruiting faculty, staff, and students from outside of the Cape Cod community.

### FAA Certification Process [Start-up]

The FAA certification process was challenging because of the rigorous nature of the process; the lack of familiarity of AMT staff with the details of the certification process; the turnover of FAA staff overseeing the approval process; and how infrequently the FAA Eastern Region FSDO certified new training locations. The FAA standards used to approve curriculum were created in the 1950s and were being revamped as CCCC was developing the AMT program, adding greater uncertainty and subjectivity to the approval process. FAA regulations provide requirements but also leave areas open to interpretation for the FAA office that is approving the curriculum. This is in part by design so that curriculum can be tailored to meet the unique needs of the region. The FAA office approving the curriculum for the AMT program had not gone through the approval process for a new program in over thirty years, since no other programs have been created recently in the region. The AMT Project Director and CCCC leadership also had not gone through an A&P certification process in the past. As a result, the approval process for the curriculum was a learning experience for both CCCC and the FAA Eastern Region FSDO.

In addition, the FAA contact that was going through the approval process with the AMT program changed part way through the process. Because of the nature of the process, in some instances the new contact had different expectations that took time for CCCC to become accustomed to. Although the certification



process was challenging, CCCC leadership and AMT faculty reported that it led to a strong working relationship with the local FAA office that will serve the program well.

### Interdependent Decisions & Procurement [Start-up]

The procurement process was challenging because of the scope and nature of the process. The volume of large purchases and technical nature of the varying procurement processes, following State and Federal requirements, was especially challenging to navigate as CCCC had not undertaken this level of simultaneous procurement purchasing before. The procurement process could be lengthy, requiring CCCC Board approval and the acquisition of multiple bids for large purchases. Some of the materials purchased also took several months to be delivered. Since the CCCC Board did not meet every month, program staff had to plan far ahead to make sure purchases could be approved. The college also had to navigate a variety of procurement regulations depending on the source of funding being used to make the purchase. Conducting the RFP process, reviewing bids, and selecting a vendor was a time-consuming process.

**"It's taken a lot. To be honest, it is hard to comprehend putting together a program of this magnitude until you sit down and do it, because everything has to come together at the same time. It is very difficult to do because all the pieces are interrelated and if you don't look at them interrelated you are really going to struggle."**

CCCC Leadership

Compounding the challenges of needing additional capacity for starting the program were other interdependent procedures. The processes of obtaining materials and equipment for the program and developing the curriculum were dependent on one another and needed to take place simultaneously. Standards for the curriculum were established by the FAA and the details of each curriculum component must be tailored to apply to the materials and equipment that will be available at the training facility. Early on, CCCC did not have a clear a sense of what materials would be required, which hindered the curriculum development process. Ultimately, decisions on materials and curriculum development needed to be completed in close collaboration with one another. With the lack of staffing on the project at the early stages, there was not enough capacity at the college to be working on both aspects simultaneously.

**"This was such a departure for this institution - the complexity - the complexity of the funding, the challenges around finding a facility. The fact that we could do it, the fact that we did it [that is success]."**

CCCC Leadership

### Adequate Initial Planning Time for Faculty [Start-up]

Little time was allotted between FAA approval for General and Airframe and the start of course instruction. This was due to the initial program delays coupled with the need to begin student cohorts that could complete during the grant periods. As a result of beginning instruction before all FAA curriculum was developed (i.e. Powerplant) and before faculty had the chance to run through all courses, students and faculty reported that especially in Cohorts 1 and 2, students experienced some downtime during instruction. For example, all students in a cohort would watch a demonstration by the instructor and then practice that technique one-at-a-time instead of having multiple concurrent opportunities for instruction and practice.



*Additional challenges faced by CCCC beyond the initial program start-up included...*

### Accelerated Program Structure

The full-time, five-day per week, schedule made it difficult for AMT faculty and staff to have time to prepare for courses, perform administrative work, integrate into the college structure (e.g. participate in college governance, attend main campus meetings), engage in knowledge sharing and professional development, and take personal time off. Students and faculty reported that the accelerated five-day a week program schedule coupled with program hours being very close to the FAA's minimum hour requirements resulted in make-up work challenges such as needing to make up classes in the evening or on the weekend. As highlighted in the *Adaptation & Flexibility of CCCC* section, CCCC has been working to address these structural challenges. CCCC has already transitioned to a four-day per week schedule for all new cohorts, starting with Cohort 3, and is preparing to apply to the FAA to increase their program hours beyond the minimum requirements, likely to go into effect in January 2019.

**"Being such an intensive course – I don't do much else besides this."**

Cohort 2 Student

**"The shift from five-days per week to four-days per week, we really needed to do that both from the student and faculty side."**

AMT Leadership

### Program Recruitment

High employer demand and student interest in the program allowed CCCC to begin program enrollment with relatively little recruitment efforts, apart from hosting student information events, having an online presence at CCCC's website, and inviting employers to tour the facility. As the program continued, the Student Retention Specialist took responsibility for some pieces of student recruitment, such as attending career fairs, as time allowed. Due to relatively minimal marketing efforts and declining community college enrollment (a trend across the nation), the college faced challenges filling later cohorts. To address these challenges, the college hired a full-time AMT Recruitment Counselor in April of 2018. The AMT Recruitment Counselor position falls under the Dean of Enrollment Management and Advising Services and is built into the college's budget. This position is specifically focused on recruitment for the AMT program. The AMT Recruitment Counselor will target efforts in the State of Massachusetts and bordering states and will work with the Director of Enrollment to develop a one-to-three year recruitment plan.

### Alignment of AMT with Community College Structure

The AMT program was the first technical program of this type to be offered at CCCC. The program was designed to meet the needs of the industry by following FAA requirements and offering training at an accelerated pace. As a result, various aspects of the AMT program design – such as the multiple start dates, the design and length of program components (e.g. General, Airframe), and the year-round schedule – have presented challenges when looking to better integrate the AMT program with the structure and flow of the college. For example, if the AMT program does not run on a semester-style schedule, then this presents challenges for student financial aid, registration, and grade/academic reporting. Integration of AMT with the college was an important step in sustaining the program after grant funds end. CCCC has been making



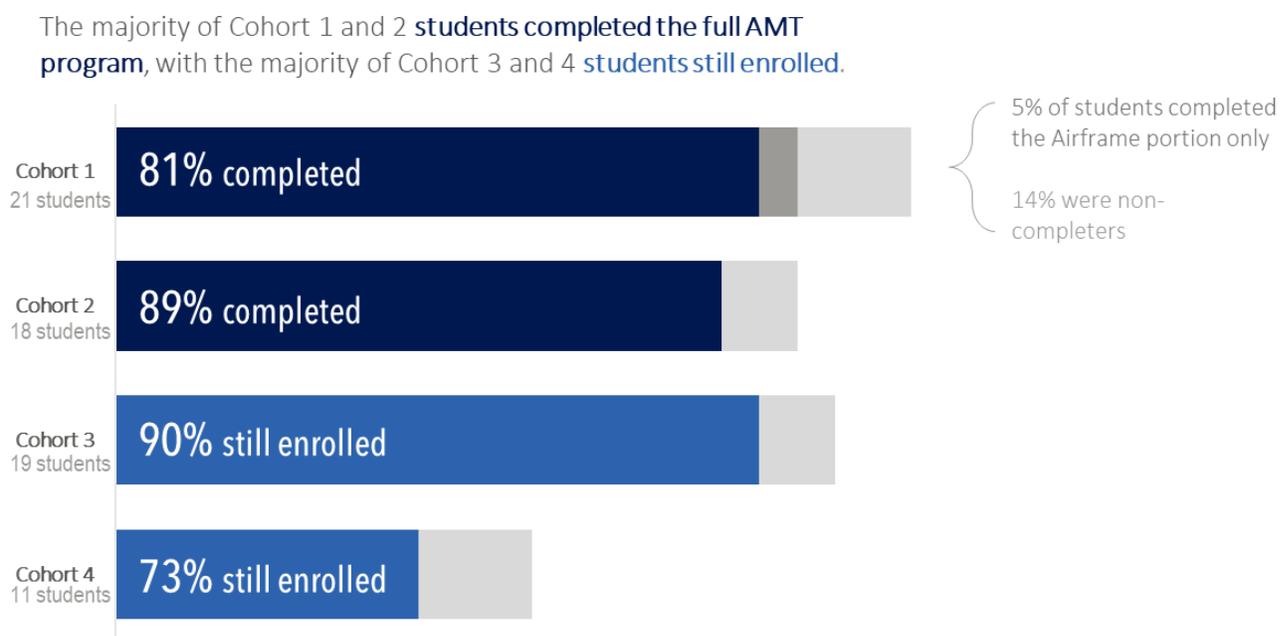
strides in AMT program integration, especially during the beginning of 2018. These are discussed in further detail in the *Beyond the Grant* section.

## Program Outputs

For the evaluation, completion was defined differently than what was reported to the U.S. Department of Labor (USDOL) using the USDOL ETA TAACCCT Outcome definitions.<sup>15</sup> Therefore, the results in this report will be different than results submitted by CCCC to USDOL. For this report, completion was defined as earning a Certificate of Completion, which included completing the aviation coursework and FAA clock hours within that module (i.e. General, Airframe, Powerplant).

Overall, 69 students participated in AMT training through four training cohorts. Cohort 1 had 21 students, Cohort 2 had 18 students, Cohort 3 had 19 students, and Cohort 4 had 11 students. Cohort 1 and 2 students have already completed the program (October 2017 and April 2018). Cohort 3 and Cohort 4 students are anticipated to complete the program December 2018 and May 2019, respectively. The figure below highlights student progress within each cohort.

Figure 6 | AMT Student Completion and Enrollment



It is important to note that an updated data file may be used by CCCC in the college's final report to USDOL. As such, data points may differ. This summary of program outputs follows the definition of program participants and completers as described in the *Outcome Evaluation*.

<sup>15</sup> United States Department of Labor Employment and Training Administration (2012). *Trade Adjustment Assistance Community College and Career Training Grants: Annual and Quarterly Program Reporting Forms & Instructions Rounds 2, 3 and 4*. Retrieved from [https://www.doleta.gov/taaccct/pdf/taaccct\\_round2\\_handbook.pdf](https://www.doleta.gov/taaccct/pdf/taaccct_round2_handbook.pdf)

## Student Stories

Interviewed and surveyed AMT students shared about the intensity of the training program, the real-life knowledge of their faculty, and the positive value they see in pursuing this training and career path:

**"Be prepared for commitment. It's a full-time job."**

Program's Intensity

**"We have people who come from the airlines, people who come from the military, we have people who come from general aviation, so we kinda get all aspects of it."**

Faculty Experience

**"The job opportunities are absolutely crazy. The jobs are out there, they're really really out there. Once you get the [FAA] certification, it's an open door."**

Career Opportunities

**"This is a tremendous opportunity for us to be here, for the [scholarship] grants that we received. It's a tremendous opportunity for the community, having a local community college having a cost-effective approach to improving your life and skills."**

Value of Program

Faculty, staff, and leadership all shared about how proud they were of the students who have been going through the AMT program. They shared that students have been able to understand and demonstrate their skills in the A&P field, which has led to several students receiving scholarships by industry partners to pursue continued aviation maintenance training, including:

**Christopher**, a Cohort 2 student who graduated in April 2018, was awarded a premier scholarship from Gulfstream Aerospace Corp to attend the Gulfstream G650/G650ER Maintenance Initial Course. Faculty estimate that this scholarship is worth around \$30,000 and say it will position him very well for his future A&P career.

**Spencer**, a Cohort 3 student, was awarded a competitive award from Satcom Direct to be able to attend their Aero IT Certification Course.

**Maureen**, a Cohort 3 student, was awarded the Delta Air Lines Aircraft Maintenance Technology Scholarship, which included covering her costs to attend the Women in Aviation International Conference in March 2018.

In addition, AMT faculty and staff have seen students perform well academically. For example, four students from Cohort 2, who graduated in April 2018, were members of the International Honors Society Phi Theta Kappa. Additionally, two students from Cohort 1 has already completed the Associate of Applied Science (AAS) in Aviation Maintenance Technology, as of May 2018.



## 29 Who Shine

*29 Who Shine* is a commencement award provided by the Massachusetts Department of Higher Education to recognize one outstanding student graduate from each higher education public institution in the state of Massachusetts – including community colleges, state universities, or University of Massachusetts campuses. *29 Who Shine* awardees are nominated by their institution of high education. Individuals chosen for the award show exceptional promise as a future leader in Massachusetts and intend to pursue a career track or interest for which there is a demonstrated need in the Commonwealth and remain in the state.

**“Whether furthering their education or entering careers in fields such as education, public policy, health care, creative arts, or engineering, the *29 Who Shine* embody the vibrant future that we all envision for the Commonwealth.”**

Massachusetts Department of Higher Education

This year, Erica Parini from the AMT Cohort 1, was nominated by CCCC. During her time in the AMT program, Erica was awarded several aviation scholarships. One was the National Business Aviation Association (NBAA) *Go Go Business Aviation* Scholarship. This scholarship award included: an all-expense paid trip to the 2017 NBAA Maintenance Conference in West Palm Beach, FL; access to all the professional aviation seminars and workshops; personal introductions to hiring managers and recruiters; and access to the networking event with over 150 business aviation companies. Another was a \$2,500 scholarship from ACONE (Aero Club of New England). This scholarship required quality references, high GPA, and an interview with the ACONE Scholarship Selection Committee. She also received the 2017 Plymouth Aero Club Scholarship and the 2017 Mike Rowe Works – Work Ethic Scholarship.



“Erica has been an outstanding student and leader within the very first cohort of Aviation Maintenance Technician (AMT) students at CCCC. Even while earning her final degree credits in the accelerated program, Erica continued working for Cape Airlines in Hyannis to keep their planes flying, providing vital support to the region’s economy. She also became a Supplemental Instructor/Tutor in the program helping other students with assignments, test prep and hands-on projects in the program’s hangars in Plymouth. Erica has also been a very busy ambassador for the program, speaking to Boy Scouts and other groups and making facility tours of various companies. Upon graduation Erica hopes to continue promoting the industry and the flying economy, as well as her own profession. Her long-term goal is obtaining an Inspection Authorization and becoming an Aviation Accident Investigator.”

*With her award, Erica chose to recognize her instructor, Robert (Bob) Nelson. “He has always pushed me to do more, and better. He’s always upbeat...and fun. With his wealth of knowledge, experience, passion and devotion to teach; his advice, and connections...Bob puts his heart and aviation soul into giving us all the information he can.”*

**“Erica getting the award was a big bump up and has raised visibility [for AMT] across the state.”**

CCCC Leadership

For more information about the *29 Who Shine* award and for quotes from Erica’s award, visit: <http://www.mass.edu/system/29whoshine.asp>

## Sustainability & Beyond the Grant

Research Question | 9

Beyond implementation during the grant period, CCCC has also focused on sustaining the AMT program. Sustainability for the program has included time and effort in transitioning AMT off grant funding and into the college structure and budget. In addition, CCCC has been working toward enhancing and leveraging the AMT program to allow the college to expand into new training areas. This section of the report will focus on these sustainability-related initiatives, which include a mix of initiatives underway and anticipated future efforts. Additionally, this report and other AMT resources and lessons learned will be shared by CCCC to further A&P education programs across the nation.

### **Transitioning from the Grant to the College**

All USDOL-funded AMT faculty and staff transitioned off the grant payroll as of March 2018, and nearly all AMT program costs will be included in the FY19 college budget. Especially during the beginning of 2018, CCCC focused on integrating the AMT program into the usual cycles of the college (e.g. semester schedules), working especially with the Dean of Enrollment Management & Advising Services and her team of Admissions, Financial Aid, Registration, and Crisis and Life Management (CALM). For example, AMT staff worked with the Registrar's Office to develop a schedule for how to have program portions align with a semester model. What resulted was a schedule with dates for: (1) last day to enroll; (2) start date; (3) last day to drop with no academic record and 100% refund; (4) registration for next module opens; (5) last day to withdraw or change status from credit to audit; (6) last day of class; and (7) final grades due. Each portion of the AMT program (i.e. General, Airframe, Powerplant) had a customized schedule and was comprised of two courses each.

This adjustment to the enrollment timelines also led to shifts in the enrollment process. Previous cohorts of students were batch registered. With the new approach, students will be responsible for registering themselves, starting with students in Cohort 3. This shift led the Student Success Coach to start scheduling one-on-one meetings with students before they transitioned from General to Airframe and from Airframe to Powerplant. These meetings are intended to help students with the registration process and address barriers or challenges to enrollment or continuing to pursue the AMT program.

Along with collaborating with the Registrar's Office, AMT staff have been working with offices and teams at the main campus – including the Bookstore, the Financial Aid Office, and the Career Planning Office, and the CALM Team – to help bring them to the AMT Plymouth location. Future plans included building out a regular schedule for when main campus individuals visit Plymouth.

In addition to AMT program integration, the college has also revisited AMT faculty and staffing onboarding. This has included having all new staff (e.g. AMT Recruitment Counselor) go through traditional onboarding trainings at the main campus, to better acclimate staff to the college.

***"From a process standpoint, I don't think [the integration collaboration] will end. Continuous improvement is the place we're in right now... It's really about planning, having multiple meetings, and working through things together."***

CCCC Leadership



## Enhancing the AMT Program

Beyond integrating AMT into the college, CCCC has also been and will continue working to enhance the AMT program.

### AMT Program Hours

As mentioned in the *Adaptation & Flexibility of CCCC* section, CCCC anticipates submitting a request to the FAA for an increase in total instruction time hours. The goal is to increase the total hours from 1,904 to around 2,000 hours by January 2019. This change would build in more time for possible disruptions in student schedules, such as snow days or sick days. In addition to building in flexibility to the schedule, CCCC is also interested in adjusting course content hours to allow for increased time in subject areas where students have needed extra training, such as basic electricity, and a decrease in hours for subjects that have been easier for students to master, such as propellers.

### Hybrid AMT Program

CCCC's goal of creating a hybrid learning program is to allow the classroom content to be delivered online while still having students come to the hangar for in-person lab time. This kind of a program would be marketed to those who are working full-time and looking to change or advance their career. An early vision of the program includes 24 months of training, where classes are offered in the evenings and on weekends and where the online portion would take place on Moodle. Moodle is an online open-source platform, where CCCC can build out the curriculum and incorporate a time tracking plug-in, which would allow the college to demonstrate the number of student classroom hours to the FAA.

**"I've got a lot of confidence in what we'll be putting together [for the hybrid AMT program]."**

AMT Faculty

The FAA requires that the program curriculum be operational for one year prior to moving portions of the instruction into an online distance learning format. Therefore, upon completion of the FAA program certification, CCCC assembled an internal AMT online program team tasked with reviewing the FAA 8900 Order guidance and the Learning Management System (LMS) requirements for moving a portion of curriculum instruction online. As of May 2018, CCCC has an AMT Faculty Coordinator leading the college's work in the hybrid program design, in collaboration with (1) their Consultant for Online Curriculum, an Associate Professor of Aviation Technologies at Southern Illinois University; and (2) the Dean of Online Education at CCCC. Through the NSF grant, CCCC anticipates hiring a web designer to support the visual development and accessibility of the online content.

This type of hybrid program design is relatively new for the FAA. There is only one program currently being offered like this in the country, located at the Spartan College of Aeronautics, in Oklahoma City. As CCCC pursues this hybrid course design, the college will need a new operations specification approved by the FAA before they can begin instruction.

### Student Housing

In May 2018, CCCC signed an agreement with Bridgewater State University for access to their student housing. This agreement set aside 10 units of housing for CCCC students, with the opportunity to expand the number of units as necessary. Leadership and staff reported that this agreement would better allow the college to bring in students from across the US and internationally for training by decreasing relocation



challenges. The agreement is set up so that Bridgewater State University will bill CCCC and CCCC will bill the AMT student, allowing these housing costs to be covered by financial aid. The housing agreement also gives students access to Bridgewater State University's student resources such as meal plans and a fitness center. As needed, CCCC also anticipates setting up a shuttle that will help transport students from their housing to the AMT Plymouth location.

**"If you're going to create a program that's sustainable, it needs to be a destination program. That's why the housing piece is so important."**

CCCC Leadership

## Additional Enhancements

CCCC and AMT staff have also been or will be working on a variety of additional program enhancements. These have involved AMT staff continuing to review and enhance how data is tracked for the FAA, including meeting with FAA representatives to discuss ideas for how to best approach the student paperwork (e.g. 4-hour blocks of time, combine attendance and make up sheets into one document). The AMT Recruitment Counselor in collaboration with the Director of Enrollment will create a one- to three-year recruitment plan, anticipated work on this plan will begin summer 2018. Another future goal is that by 2019 there will be an AMT student club, similar to other CCCC clubs, which will include money to support club needs.

## Leveraging the AMT Program

CCCC and AMT leadership, faculty, and staff have been exploring opportunities for leveraging the current AMT program to create additional training opportunities. Three primary areas of focus are described below. Additional future opportunities for the AMT program could include expanding training around smaller components of AMT such as welding or painting.

### Customized Employer Training

AMT faculty and staff are exploring options to provide customized training for local companies in collaboration with the Center for Corporate and Professional Education at CCCC. Training opportunities include leveraging current equipment to serve employers who want to send their employees to AMT for customized training related to their industry (e.g. painting training). For example, General Electric (GE) in Lynn, Massachusetts reached out to CCCC to see if the college could prepare a program for their union workers. The GE location makes jet engines and has workers who are looking to advance into technical fields. Training for GE will likely cover topics such as basic math, electricity, and turbine engine technology – pulling pieces from the General and Airframe curriculum.

### Avionics Program

By attending the Aviation Technician Education Council (ATEC) Annual Conference in 2017 and speaking with local employers, AMT faculty and CCCC leadership reported hearing about the demand for avionics training. Avionics focuses on electricity for aircrafts including communications and navigation systems. AMT faculty and staff are working in collaboration with the Center for Corporate and Professional Education at CCCC to develop this new program. Similar to how the college is approaching the hybrid program, for Avionics program development, there is an AMT Faculty Coordinator leading the initiative.

The vision for Avionics is that it would be an add-on course to the AMT program. Because it is outside of the FAA's Part 147, the college would not need FAA approval to offer the course, but the AMT program



would need to work collaboratively with the main campus on developing the content and structure, so it aligns with the college's operations. Currently the college anticipates the program to be a 320-hour course for 16 weeks at 20 hours per week, which would operate in the evenings and weekends. After completing the program students could test for the National Center for Aircraft Technician Training's (NCATT) Aircraft Electronics Technician (AET) Standards exam, which test for basic level skills and abilities in avionics.

**"If you had avionics [certification], any airline would hire you immediately and you'd be at the top end of the salary."**

AMT Faculty

### AMT Refresher Course

One of the AMT faculty members is working on developing a refresher course for individuals who feel confident with their experience in some areas of A&P but may want additional training or a refresher around other A&P concepts. The target audience for this course are individuals who have already received FAA approval to take the A&P certification testing, such as military personnel who have the required hours of training and hands-on experience, but who may have focused on one area of A&P (e.g. Airframe) and want additional experience in another (e.g. Powerplant) before testing.

### **Disseminating Program Information**

Sharing about the development of the AMT program pathways and lessons learned is an important component of building AMT program buy-in to support sustainability and of developing resources that can be leveraged by other institutions.

During the grant, CCCC engaged industry advisory board members and employer partners in discussions about AMT curriculum development, technology use, and alignment with the industry needs through joint meetings and state-of-the-industry presentations. The AMT program has served as host for the South Coast and Cape & Islands School Guidance Association meeting, which provided an opportunity to inform high school guidance counselors from across Southeastern Massachusetts about the AMT program, including a tour of the training facility.

At the fourth annual TAACCCT convening sponsored by USDOL in Washington, DC in September 2017, CCCC presented on the use of AMT student support services. This presentation reviewed the development and implementation of support services that followed a student from inquiry through graduation and employment for the accelerated AMT program. CCCC has also been working on a dynamic video about the AMT program, featuring program faculty, staff, students, and employer partners. Once completed, the video will be posted on the Cape Cod Regional STEM Network website, along with a feature article.<sup>16</sup>

At the conclusion of the USDOL TAACCCT Round 4 grant, CCCC will upload curriculum and other AMT resources on to *SkillsCommons*, an online repository of free workforce training information. *SkillsCommons* was created as a result of the USDOL TAACCCT program and contains program materials developed by TAACCCT grantees. This information is an Open Educational Resource (OER) available to the public for free and includes information about curriculum design, program development, and program evaluation.<sup>17</sup> CCCC

---

<sup>16</sup> Cape Cod Regional STEM Network website: [www.capecodstemnetwork.org](http://www.capecodstemnetwork.org)

<sup>17</sup> For additional information and to access *SkillsCommons* resources go to: <https://www.skillscommons.org/>



is also exploring additional discrimination approaches, including sharing lessons learned through the *Cape and Islands STEM Network* housed at CCCC and the *STEM Ecosystems* nationwide learning community.

## **Strengthening the College**

Through the AMT program, CCCC has expanded the college's technical program offerings. While the college does have health-care degrees, the AMT program represents a truly new type of offering at the college.

**"CCCC has been traditionally a liberal arts college. We hadn't had a push into the technical fields, and this was that moment."**

CCCC Leadership

Due to its location in Plymouth, the AMT program has also expanded the college's footprint beyond the traditional service area, with the ability to better draw from metro areas such as Boston, MA.

**"I think it's strategic to offer college degrees beyond the Cape... This program has allowed us to expand beyond the Cape and Island residents."**

CCCC Leadership

In addition, CCCC leadership shared about the importance of the program in helping the college develop processes and approaches to grants, especially more complex grants such as USDOL TAACCCT. As a result of receiving funding for the AMT program, the college hired a Grant Compliance and Research Analyst. The vision for this position was to have someone at the college who could help support grant directors, especially in the areas of data collection and grant compliance. It was through navigating various grant requirements, as well as needing to adjust during the departure of CCCC staff from key grant-related positions such as procurement, that the role of the Grant Compliance and Research Analyst and the college's internal grant processes were strengthened.

As the AMT program continues to grow in program graduates and continuously refine program delivery, leadership, faculty, and staff anticipate additional opportunities for enhancing and leveraging AMT to build a hybrid AMT program, an Avionics program, and customized employer training.



## Start-up Advice for Future Programs

Research Question | 8

Based on the experience of creating a new FAA A&P certification program within the college, CCCC can share the following advice with colleges or entities that may consider developing a similar program:

### Preparation

- **Background Research** – Research and reach out to other similar programs (i.e. FAA A&P Part 147 programs housed at a college) to learn more about their programs (e.g. program structure) and what is necessary to start them.
- **Implementation Timeline** – Build a timeline highlighting tasks, stakeholders, and resources needed for developing the program. When developing the timeline, consider that implementation will likely take longer than projected.
- **Project Manager** – Identify an individual who will be responsible for driving progress related to the timeline and need for simultaneous progress. This individual will need to have project management skills but not necessarily FAA A&P expertise.
- **FAA A&P Expertise** – Hire faculty or consultants with experience and expertise in developing a new FAA A&P Part 147 program. These individuals can lead curriculum development.
- **Administrative Expertise** – Meeting FAA standards requires considerable documentation and well-maintained records, as the FAA can audit certified training providers at any time. Before the program starts, it is important to have an approach or system established for maintaining the records. It is also imperative to have staff who are skilled in keeping detail-oriented records.
- **Multiple Funding Streams with Staffing**– If possible, pursue multiple funding avenues to provide increased flexibility to make investments into the program (e.g. equipment and supplies purchases) and ongoing program adjustments. For any funding stream used, ensure there is someone who is well-versed in the funding requirements, especially around areas of procurement and reporting.

*“One of the smartest things we did was hire a Compliance Officer... she’s worth her weight in gold.”*

CCCC Leadership

- **Communication Strategy** – Communicate well about the program with both implementers (e.g. faculty in the program) and other stakeholders (e.g. other college faculty), including its goals, progress, and anticipated benefits. When developing communication approaches, engage a variety of stakeholders at the college or other organizations to establish buy-in for longer-term sustainability. Avoid focusing on buy-in for just those who will need to be immediately engaged in program implementation (e.g. information technology, building and facilities).
- **Recruitment Strategy** – Develop an approach to recruitment for the program early in program implementation. This can include target recruitment audiences, methods of reaching these audiences, timeline for when these actions will take place (e.g. some could take place while the college is in the process of seeking FAA approval), and who will take responsibility for each task (e.g. recruiter, faculty, director).

### Relationships

- **Industry Relationships** – Build relationships with industry members early and seek their input for purchasing decisions and/or donations.



- **FAA Relationship** – Start building a relationship with the FAA’s regional Principal Maintenance Inspector (PMI) early to understand the PMI’s expectations and advice, as well as the culture of the FAA.

### **Timing & Feedback**

- **Certification Approval** – Build, receive approval for, and pilot curriculum before beginning student cohorts.
- **Professional Development** – Provide professional development opportunities early in the program, or before the program starts. This can include teaching-related training such as classroom management, and A&P-related training and networking opportunities.
- **Continuous Improvement** – Allow time for continuous improvement and build in feedback loops (e.g. regular team meetings to reflect on successes and challenges, regular check-ins with employers for feedback on graduates) across the variety of program stakeholders (e.g. faculty, staff, leadership, students, employers).



# Outcome Evaluation

## Design Summary

The Outcome Evaluation includes a summative analysis of CCCC's four AMT cohorts using descriptive and inferential statistical analyses. Methodological and design conversations concerning the quantitative analysis began at the onset of the project. Throughout the life of grant implementation, the Evaluation Team continued discussions with CCCC around appropriate quantitative designs, using insight from the Implementation Evaluation and analysis from test data pulls to guide the conversation. As highlighted in the *Implementation Evaluation*, the program took longer to start-up than originally anticipated, and this led to fewer AMT student cohorts. Due to this change, and other data factors discussed in *Appendix B*, the Evaluation Team finalized the quantitative analysis as an outcomes-only evaluation.

## Research Questions

The Outcome Evaluation sought to answer two research questions:

- 1.** To what extent do outcomes differ between cohorts?
- 2.** To what extent do outcomes differ within cohorts?
  - a. How do student outcomes differ by subgroup?

Data came from a variety of sources, including CCCC administrative data, student intake forms, and exit surveys. This information was collected throughout the life of the grant, with a final data pull completed in mid-May of 2018 and sent to the Evaluation Team in June of 2018. CCCC did not distinguish information by APR period as the college did with USDOL. As such, information provided in the final file did not exactly correspond with the specific USDOL outcome definitions. Descriptions about the data can be found in *Appendix B*.

The analysis focused on frequencies and percentages, as these provide useful information about student outcomes. Descriptive data was separated by categories (i.e. disaggregated) as appropriate, including disaggregations by cohort. These results allowed for further understanding of the types of individuals who participated in CCCC's AMT program, and potential between- and within-group differences.

Power analyses were performed to determine which statistical tests could be conducted. Due to the small sample size, most traditional statistical tests, such as chi-square tests and regression, were not appropriate for the AMT data. Instead, the Evaluation Team used a number of rudimentary statistical tests, such as t-test for independent samples, if an acceptable power threshold was achieved. To supplement these findings, effect sizes were also computed, as appropriate, which helped substantiate any statistically significant results from these tests. Effect sizes are useful for understanding if the statistically significant results are practically relevant. They also served as an additional safeguard to fallacious *p*-values insofar as they are indifferent to significances that may result from sample size.

Please reference *Appendix B* for in-depth information on the analysis procedures.

## AMT Overview

Overall, 69 students participated in AMT training through four training cohorts. Cohort 1 completed the AMT program in October 2017, Cohort 2 completed in April 2018, and Cohort 3 and Cohort 4 are anticipated to complete December 2018 and May 2019, respectively. AMT students in the first three cohorts are relatively similar, with Cohort 4 having slightly lower enrollment.

## Background Characteristics

As shown, the cohorts are generally similar, with a few exceptions. Across all the cohorts, there are more male students. Among Cohorts 1-3, there were more white students, while Cohort 4 had slightly more non-white students. The mean age was mid-to-late twenties (25.3 – 29.6 years old).

Figure 7 | AMT Students by Cohort

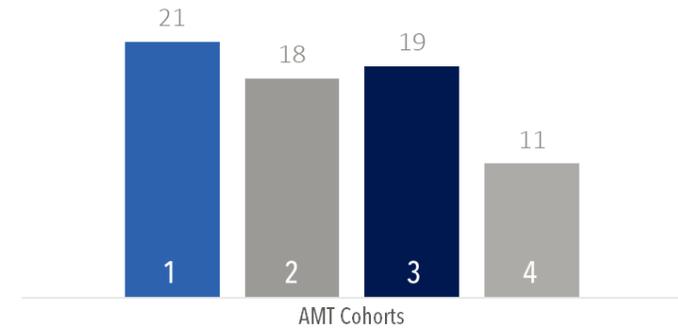


Figure 8 | AMT Student Background Characteristics

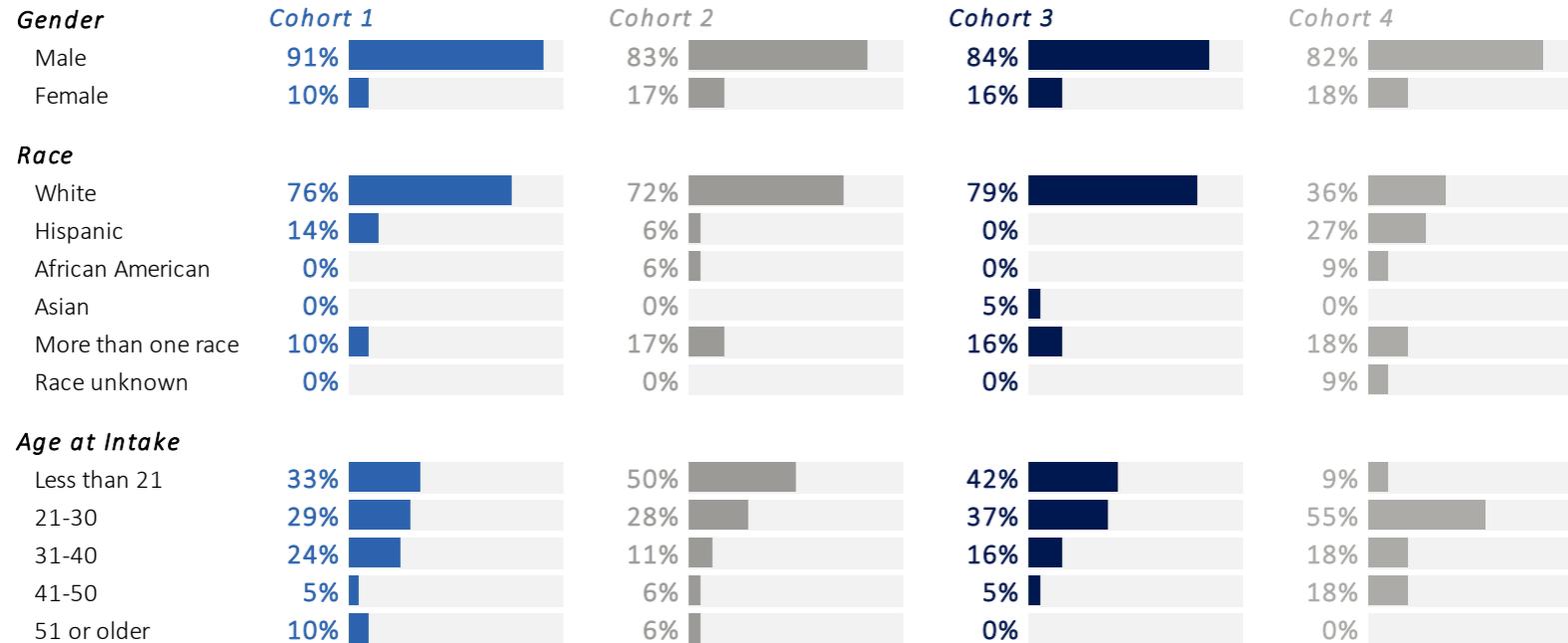
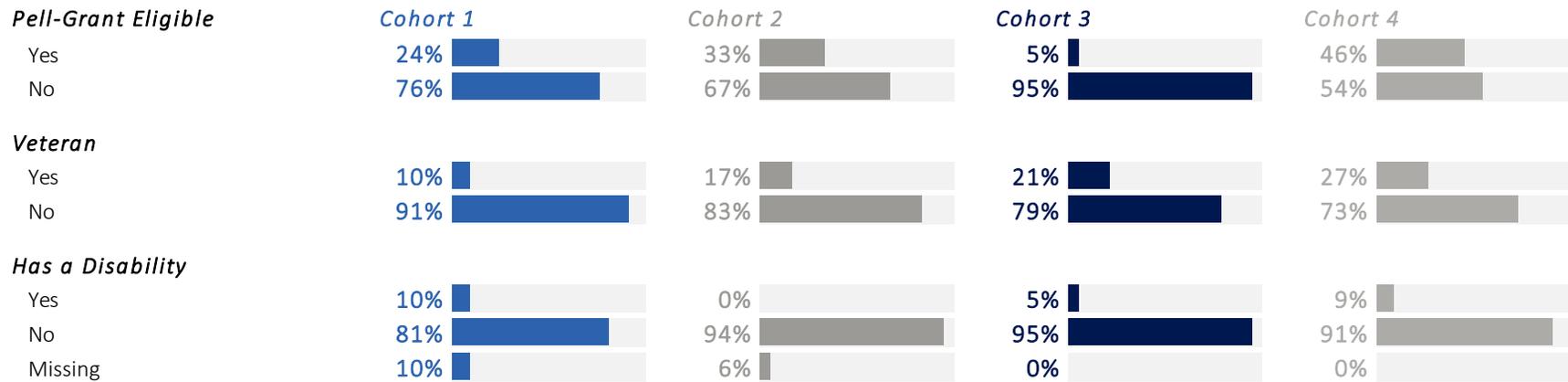
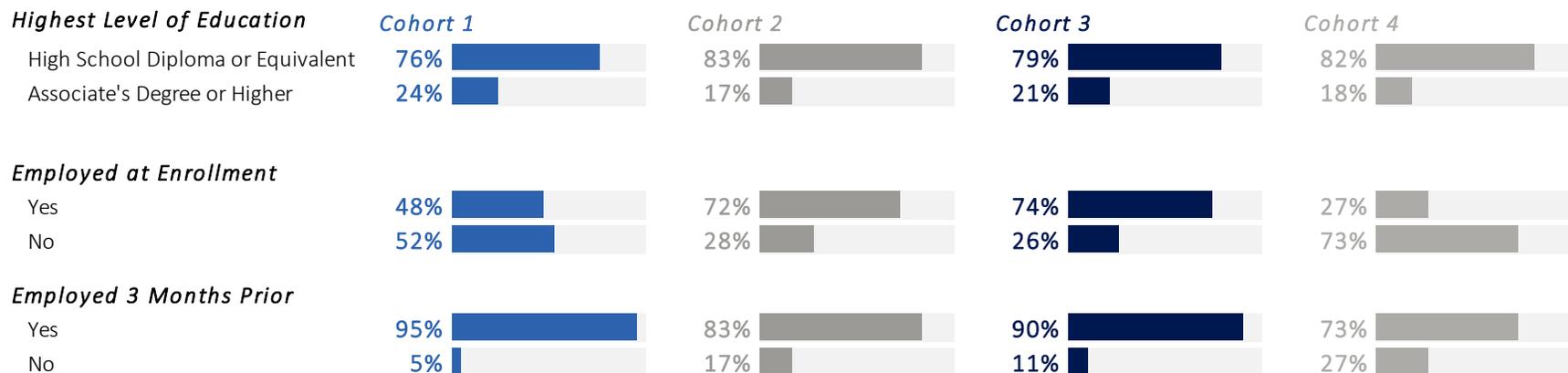


Figure 9 | AMT Student Characteristics



The majority of students were not Pell-Grant eligible, were not veterans, and did not have a disability. The highest level of education most students had was a high school diploma or equivalent. More students from Cohorts 1 and 4 were *not* employed at enrollment in the AMT program, while the majority of students from Cohorts 2 and 3 were employed at enrollment. Overall, all cohorts had students employed 3-12 months prior to enrollment. For additional demographic data and other student characteristics, see *Tables C1 and C2* in *Appendix C*.

Figure 10 | AMT Student Education & Employment



## Findings from the Outcome Evaluation

For the evaluation, completion was defined differently than what was reported to the U.S. Department of Labor (USDOL). Therefore, the results in this report will be different than results submitted by CCCC to USDOL. For the TAACCCT reporting to the USDOL, completion was defined in the reporting guidelines (p. 9) as “having earned all of the credit hours (formal award units) needed for the award of a degree or certificate in that program of study. Participants should only be included once, even if they complete multiple programs.”<sup>18</sup> For a student to be counted as a completer, the individual needed to earn all credit hours required for a college degree or certificate.

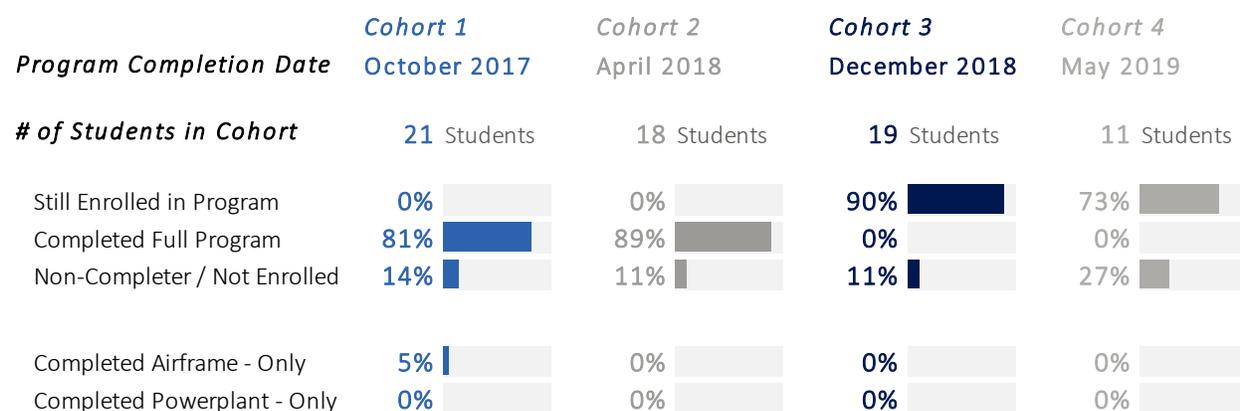
To gather a more comprehensive understanding of how students were progressing in the AMT program, the Evaluation Team defined completion differently. For this report, completion was defined as earning a Certificate of Completion, which included completing the aviation coursework and FAA clock hours within that module (i.e. General, Airframe, Powerplant). The Evaluation Team analyzed completion of FAA clock hours by AMT program, completion of FAA credentials, and completion of college certificates, if applicable.

Findings from the Outcome Evaluation are presented around each research question. As a note, all students were full-time in the AMT program.

### Research Question 1: Patterns Between Cohorts

The students in each cohort were generally homogenous, and there were few differences in overall outcomes between the different cohort groups. Even though the AMT program is designed with stackable credentials that allow students to complete one portion of the program (e.g. Airframe) and then exit with a CCCC certificate and eligibility to test for an FAA credential, almost all students in the first two cohorts completed the entire program (81.0% – 88.9%).<sup>19</sup> Moreover, the majority of students in Cohorts 3 and 4 were still enrolled (72.7% – 89.5%).

Figure 11 | AMT Completion by Cohort

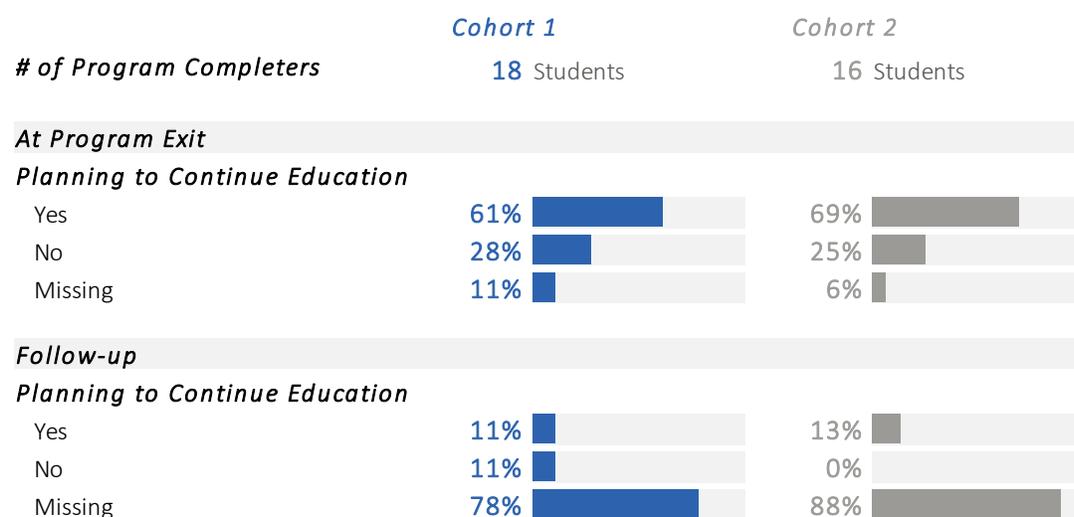


<sup>18</sup> United States Department of Labor Employment and Training Administration (2012). *Trade Adjustment Assistance Community College and Career Training Grants: Annual and Quarterly Program Reporting Forms & Instructions Rounds 2, 3 and 4*. Retrieved from [https://www.doleta.gov/taaccct/pdf/taaccct\\_round2\\_handbook.pdf](https://www.doleta.gov/taaccct/pdf/taaccct_round2_handbook.pdf)

<sup>19</sup> Note that completion was defined as earning a Certificate of Completion, which included completing the aviation coursework and FAA clock hours within that module (i.e. General, Airframe, Powerplant).

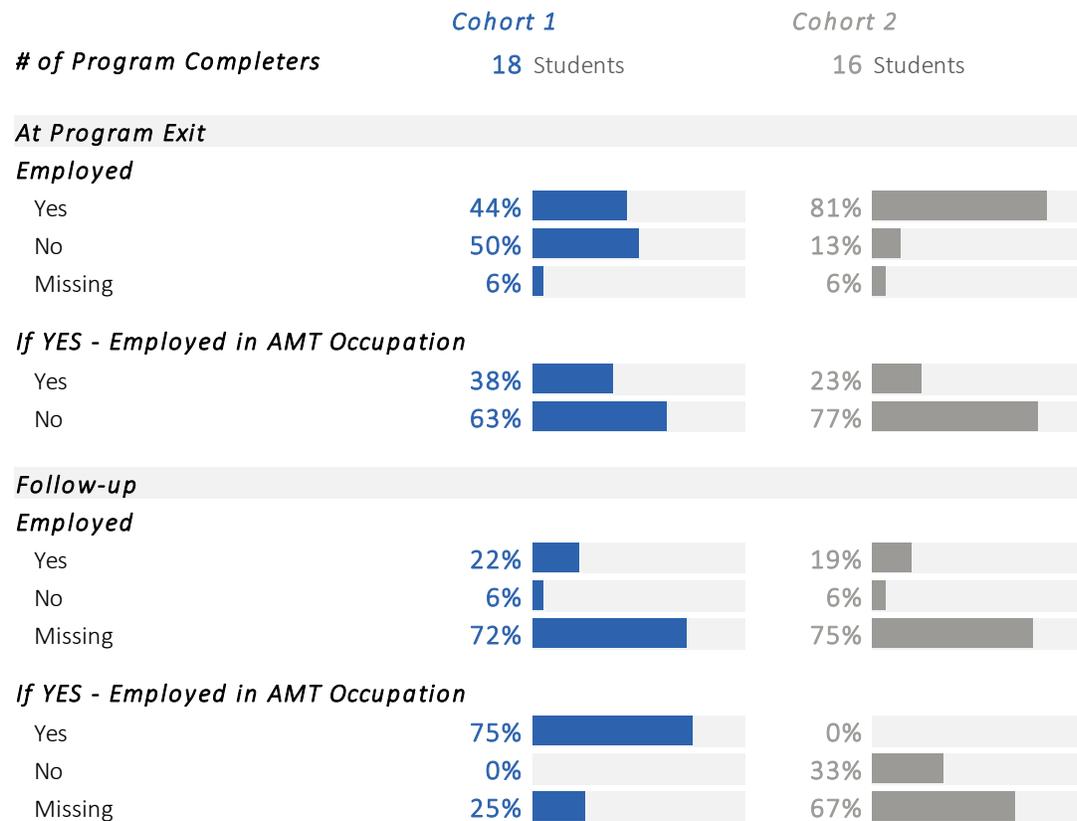
Figures 12 and 13 display the outcomes for students who completed the program in Cohorts 1 and 2. As shown, many of the responses were missing for the different outcomes. Of those who responded, almost two-thirds of program completers reported that they were planning on continuing their education at their exit survey (64.7%), and that they were employed (61.8%). However, few of the AMT program completers who reported that they were employed reported that they were working in an AMT occupation in their exit survey (17.6%). At the follow-up survey, conducted in May-June of 2018, fewer program completers responded (between 11.8% – 26.5% of completers), though slightly more students planned to continue their education (66.7% of those who responded), were employed (77.8% of those who responded), and were employed in an AMT occupation (75.0% of those who responded). Roughly equal numbers of students from both Cohorts 1 and 2 were planning to continue their education, though a greater percentage of students from Cohort 2 reported that they were employed after exiting the program (81.3%).

Figure 12 | Plans to Continue Education by Cohort



In Figure 13, few students from Cohorts 1 and 2 reported that they were employed in an AMT occupation upon immediate program exit and few students from Cohort 2 reported employment in an AMT occupation during follow-up. This was likely because of the importance of FAA credentials. AMT leadership, faculty, and students all reported that passing the FAA tests were important to employment in the AMT field. For data collected immediately at program exit, most students had not yet completed FAA testing. Similarly, because Cohort 2 students completed in April 2018 and follow-up took place in May-June 2018, there was not enough time for most of the students to take their full FAA credential tests. Future follow-up data collection on student employment and employment in an AMT occupation will be valuable to better understand AMT student placement in FAA career paths.

Figure 13 | Employment by Cohort



Additional data for Research Question 1 is available in *Tables C3 and C4* in *Appendix C*.

## Research Question 2: Patterns within Cohorts

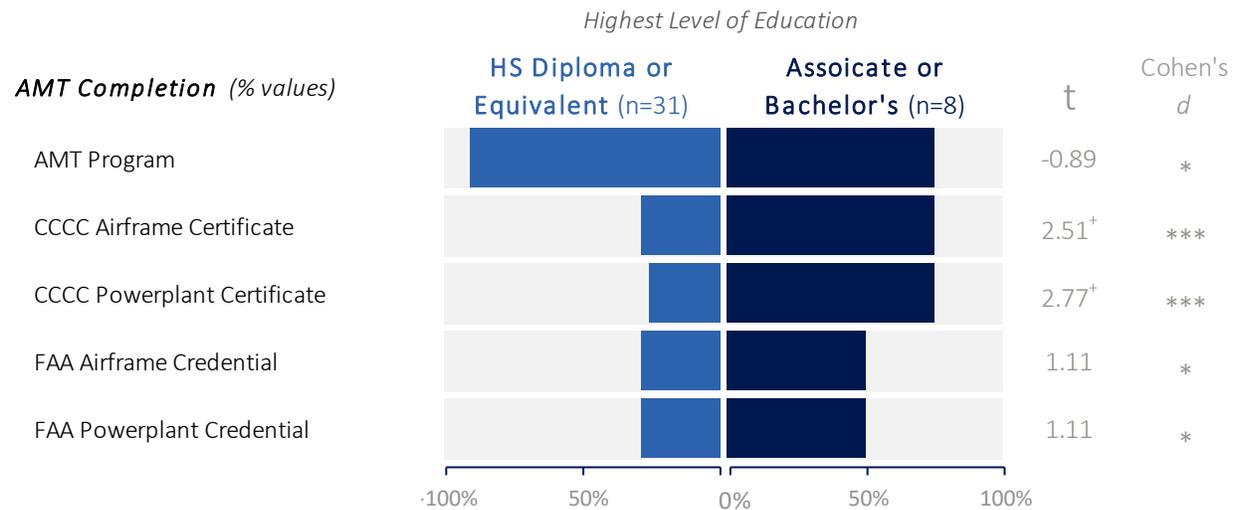
Statistical tests that compare group outcomes were computed to examine differences in the rates of those who completed the CCCC Certificates and FAA credentials<sup>20</sup> between those who had a high school diploma or equivalent and those who had a college degree (i.e. associate or bachelor’s degrees) as their highest level of education before enrolling in the AMT program.<sup>21</sup> Students in Cohorts 1 and 2 who had a college degree had higher rates of completion, with statistically significantly higher rates of completion for the CCCC Airframe Certificate ( $t=2.51, p=0.02$ ) and the CCCC Powerplant Certificate ( $t=2.77, p=0.01$ ). Furthermore, the effect sizes between the two groups for these two outcomes were large, (0.99 and 1.08 respectively).<sup>22</sup> This means that students who already had a college degree before enrolling in the AMT program had substantially better rates of completion for the CCCC Airframe and Powerplant Certificates.

<sup>20</sup> FAA Credentials are self-reported.

<sup>21</sup> Note that completion was defined as earning a Certificate of Completion, which included completing the aviation coursework and FAA clock hours within that module (i.e. General, Airframe, Powerplant).

<sup>22</sup> Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2<sup>nd</sup> ed). Hillsdale, NJ: Lawrence Earlbaum Associates, 2.

Figure 14 | Cross Tabulations of AMT Program Completion by Highest Level of Education (N=39)



<sup>†</sup>t-Statistic is statistically significant at  $p < .05$

Cohen's *d* effect sizes are small=.20 (\*), medium=.50 (\*\*), or large=.80 (\*\*\*)

In the figure above, students who finished the full sequence of AMT program modules included those who completed General to Airframe to Powerplant, with the exception of one student who exited the program after the successful completion of General and Airframe. Students who already had a college degree were older – the mean age for those with highest level of education is high school diploma or equivalent was 23.8 years old while the mean age for those with highest level of education is associate or bachelor’s degree was 45.4 years old – though age did not have a significant correlation with program completion.

Additional findings for Research Question 2 are available in *Table C5* in *Appendix C*.

# Conclusion

## Lasting Effects of the Grant

With the support of grant and state appropriation funding, CCCC has been able to create an entirely new state-of-the-art technical program. Through the AMT program, CCCC has expanded the college's offerings beyond liberal arts further into technical education. Due to its location in Plymouth, the AMT program has also expanded the college's footprint beyond the traditional service area, with the ability to better draw from metro areas such as Boston, Massachusetts.

In addition, CCCC leadership shared about the importance of the AMT program in helping the college develop processes and approaches to more complex grants, such as USDOL TAACCCT. This has included having a designated position for grant support in the Grant Compliance and Research Analyst, as well as developing stronger internal policies around procurement and grant structure.

As the AMT program continues to grow, leadership, faculty, and staff anticipate additional opportunities for enhancing and leveraging AMT beyond the current potentials, such as a hybrid AMT program, an Avionics program, and customized employer training (see additional details in *Sustainability & Beyond the Grant*).

**"I think it's given us a different frame of reference. It's positioned us well in the industry and we're on route to be a recognized leader... We're moving in a strong direction."**

CCCC Leadership

## Recommendations for Future Research

It is beyond the scope of this evaluation to make value judgments about whether the degree of tangible and intangible success obtained as a result of CCCC's AMT program was sufficient to warrant the amount of public investment made. However, early findings from this report show promise. Students reported finding the AMT training program valuable and students, faculty, staff, and employers all shared about the value of and need for trained AMT professionals in the workforce. Furthermore, most of these students have been persisting in their programs or completed their certifications. However, due to increased start-up time needed for the program, and slower investment in recruiting and marketing for the program, there was not a large enough pool of student outcomes to analyze to determine if there were substantial patterns in employment outcomes. Future research can be conducted to examine the impact of this program on students, once more data is collected from a larger number of students. This can include more complete information about students' wages and employment once they exit, as well as whether they received their FAA credentials. This information could be used to provide more context on the qualitative results, where faculty and staff reported that program completers were finding meaningful and well-paying employment in the AMT field. The types of future analyses could include time series analyses or other advanced inferential statistical procedures to measure the extent that programming had on employment outcomes. More data could also be collected on future cohorts of students to examine the extent that student outcomes change as the program matures. Additionally, as future data is available evaluators could also examine the correlation between program module grades and FAA testing success to determine how well curriculum is preparing students for testing and to highlight topic areas that may require adjustment.

In addition, a future analysis could explore the impact that the AMT program had on students, compared to students of similar characteristics and who enrolled in similar programs. During interviews, AMT faculty and staff commented about the presence of a for-profit school in the Boston area that also provided training for the FAA A&P. Also, through CCCC's research into other FAA A&P training programs, the college learned about other public schools that offered aviation maintenance technician training. Should opportunities for data sharing arise, a future analysis could include a quasi-experimental design comparing student outcomes from CCCC's AMT program with those of one or multiple other FAA A&P training programs.

Moreover, future research could provide a more nuanced understanding of how well the program is meeting student needs and is connecting to the workforce. A review of factors associated with successful completion could be integrated into advisory sessions held with students interested in the program. A student inventory could be included to measure if students interested in the program are a good fit based on prior experiences, as well as determine if students need specific supports. In addition, employer feedback could be reviewed to determine the extent that the AMT curriculum aligns with the workforce needs.

Future research could also examine if some of these delays in establishing new programs could be mitigated. If this is a common challenge for TAACCCT grantees (and other USDOL grantees), perhaps there are ways to share best practices through future implementation evaluations that explicitly look for accelerators or barriers to timely program start-up across a number of different institutions, including CCCC. These could be used to identify the accelerators and mitigate the barriers that might occur.

Finally, future research could follow CCCC leadership, staff, and faculty, who were impacted by the grant, during their sustainability efforts and expansion into other programs (i.e. Avionics program). Some of this additional research will take place through the NSF ATE grant evaluation, which will track AMT program progress through mid-2019. The findings from the NSF ATE evaluation and further research could help provide an understanding of the progress of these sustainability and institutional capacity efforts. This knowledge could be used to inform policies for future grant-funded programs.

# Appendix A: Implementation Evaluation Methods

The Implementation Evaluation began January 2015 and continued through May 2018<sup>23</sup> to document program progress, to monitor program outcomes, and to provide recommendations for continuous improvement of program operations. During the evaluation, the Evaluation Team employed principles of a utilization-focused framework.<sup>24</sup> The substantiated assumptions<sup>25</sup> of utilization-focused evaluation are: (1) intended users are more likely to utilize evaluation findings if they understand and value the evaluation’s processes; (2) intended users are more likely to understand and value the evaluation’s process if they are engaged in evaluation decisions; (3) engaged intended users both enhance the credibility of evaluation findings and possess greater capacity for utilizing findings to improve the program; and (4) capacity for utilizing findings relies heavily on a collaborative, functional relationship between evaluators and intended users.

Additionally, the formative component of the Implementation Evaluation offered real-time feedback as the Aviation Maintenance Technology (AMT) program rolled out, through regular phone calls, quarterly milestone summaries, and annual evaluation reports. This provided the Evaluation Team the opportunity to identify and share early evidence of strengths and areas for growth throughout the development of the program, as opposed to offering information only retrospectively.

## Research Questions

Table A1 summarizes the research questions<sup>26</sup> examined through the Implementation Evaluation, including ties to data sources and analysis methods. Further details on data sources and collection plans, analysis methods, and potential limitations are detailed in subsequent sections.

Table A1 | Implementation Evaluation Research Questions

Research Questions	Data Sources	Analysis Methods
1. How was the particular curriculum selected, used, and/or created?	<ul style="list-style-type: none"> <li>Implementation Calls</li> <li>Site Visit Interviews</li> <li>Program Documents</li> </ul>	<ul style="list-style-type: none"> <li>Document and synthesize themes from CCCC leadership and AMT staff and faculty</li> </ul>
2. How were programs and program designs improved or expanded using grant funds? What delivery methods were offered? What was the program administrative structure? What support services and other services were offered?	<ul style="list-style-type: none"> <li>Implementation Calls</li> <li>Site Visit Interviews</li> <li>Program Documents</li> </ul>	<ul style="list-style-type: none"> <li>Document and synthesize themes from CCCC leadership and AMT staff and faculty</li> <li>Review program documents</li> </ul>

<sup>23</sup> Grant implementation took place up to March 30, 2018. April 1, 2018 through September 30, 2018 was additional time for evaluation analysis and reporting. A final site visit took place in May 2018 to capture grant implementation progress, as a result, some qualitative data from after the extension period has been included within this report.

<sup>24</sup> Patton, M.Q. *Essentials of Utilization-focused Evaluation*. Thousand Oaks, CA. SAGE Publications, Inc., 2012.

<sup>25</sup> Brandon, P., N. Smith, C. Trenholm, and B. Devaney. (2010) *The Critical Importance of Stakeholder Relations in a National, Experimental Abstinence Education Evaluation*. *American Journal of Evaluation*, 31(4). 517–531.

Patton, M.Q. *Essentials of Utilization-focused Evaluation*. Thousand Oaks, CA. SAGE Publications, Inc., 2012.

Taut, S. (2008) *What Have We Learned about Stakeholder Involvement in Program Evaluation?* *Studies in Education Evaluation*. 34.

<sup>26</sup> Research Questions 1-4 were required by USDOL. Research Questions 5-9 were added by the Evaluation Team. The primary research question for Research Question 3 was added to capture a broader analysis approach, instead of Yes/No only responses.

Research Questions	Data Sources	Analysis Methods
3. How were assessment tools used to select participants for the AMT grant program? Was an in-depth assessment of participants' abilities, skills, and interests conducted to select participants into the grant program? What assessment tools and processes were used? Who conducted the assessment? How were the assessment results used? Were the assessment results useful in determining the appropriate program and course sequence for participants? Was career guidance provided, and if so, through what methods?	<ul style="list-style-type: none"> <li>• Implementation Calls</li> <li>• Site Visit Interviews</li> </ul>	<ul style="list-style-type: none"> <li>• Document and synthesize themes from AMT staff, faculty, and participants</li> </ul>
4. What contributions did each of the partners (employers, workforce system, other training providers and educators, philanthropic organizations, and others as applicable) make in terms of: (1) program design, (2) curriculum development, (3) recruitment, (4) training, (5) placement, (6) program management, (7) leveraging of resources, and (8) commitment to program sustainability? What factors contributed to partners' involvement or lack of involvement in the program? Which contributions from partners were most critical to the success of the grant program? Which contributions from partners had less of an impact?	<ul style="list-style-type: none"> <li>• Implementation Calls</li> <li>• Site Visit Interviews</li> </ul>	<ul style="list-style-type: none"> <li>• Document and synthesize themes and details from CCCC leadership, AMT staff and faculty, and partners</li> </ul>
5. What program outputs have been generated to date? What barriers hindered output achievement? What factors unexpectedly improved output achievement? Why?	<ul style="list-style-type: none"> <li>• Implementation Calls</li> <li>• Site Visit Interviews</li> <li>• Student Forms</li> <li>• Student Survey</li> <li>• Program Documents</li> </ul>	<ul style="list-style-type: none"> <li>• Document and synthesize themes from CCCC leadership, AMT staff and faculty, and participants</li> <li>• Review all USDOL and CCCC internal program reports</li> </ul>
6. How satisfied are program partners, staff, and participants with the program? Why?	<ul style="list-style-type: none"> <li>• Implementation Calls</li> <li>• Site Visit Interviews</li> <li>• Student Survey</li> <li>• Student Forms</li> </ul>	<ul style="list-style-type: none"> <li>• Document and synthesize themes from AMT staff and faculty, participants, and partners</li> </ul>
7. What have been successes and obstacles to program performance?	<ul style="list-style-type: none"> <li>• Implementation Calls</li> <li>• Site Visit Interviews</li> <li>• Program Documents</li> </ul>	<ul style="list-style-type: none"> <li>• Document and synthesize themes and details from CCCC leadership, AMT staff and faculty, and participants</li> <li>• Review all USDOL and CCCC internal program reports</li> </ul>
8. How can program processes, tools, and/or systems be modified to improve performance?	<ul style="list-style-type: none"> <li>• Implementation Calls</li> <li>• Site Visit Interviews</li> <li>• Student Survey</li> <li>• Student Forms</li> </ul>	<ul style="list-style-type: none"> <li>• Document and synthesize themes from CCCC leadership, AMT staff and faculty, participants, and partners</li> </ul>
9. How can the program expand or enhance institutional capacity? What are the most promising programmatic components to use institution-wide? Why?	<ul style="list-style-type: none"> <li>• Implementation Calls</li> <li>• Site Visit Interviews</li> </ul>	<ul style="list-style-type: none"> <li>• Document and synthesize themes from CCCC leadership, and AMT staff and faculty</li> </ul>

## Data Sources & Collection

Data for the Implementation Evaluation was collected from the following data sources:<sup>27</sup>

- Implementation calls and communication
- Site visit interviews with key stakeholders
- Student survey
- Student forms
- Program document reviews

### Implementation Calls

The Evaluation Team held regular calls (monthly in Year 1, and bi-monthly in subsequent years) with CCCC's Grant Compliance and Research Analyst and additional CCCC stakeholders, such as the Student Retention Specialist, as appropriate. The primary function of these calls was they allowed CCCC to provide the Evaluation Team with timely information regarding AMT processes, progress, obstacles, and successes. These findings were elaborated upon during site visit interviews, but calls provided leadership with an opportunity to recall events and challenges more frequently than the site visits. The Evaluation Team compiled notes from these calls and provided CCCC with a quarterly milestone summary based on the calls and any documents reviewed. This summary was distributed to others at CCCC as needed, and feedback was provided to the Evaluation Team to ensure an accurate understanding of grant progress was being captured. These notes are stored on Thomas P. Miller & Associates' servers and provided a timeline of relevant occurrences used as a reference point for site visit interviews and reporting.

An additional role of the implementation calls was to support administrative and data-related functions. Regular correspondence through calls and emails assisted the Evaluation Team with evaluation-related scheduling, IRB document submissions, and updates on data sharing and access. Data calls were also scheduled to discuss quantitative analysis methodology and to review the most recent AMT timelines for enrollment and completion data. The Evaluation Team maintained ongoing communication with the CCCC's Grant Compliance and Research Analyst through the life of the grant.

Implementation calls with CCCC took place throughout the grant implementation period. When USDOL granted CCCC a six-month grant implementation extension, the Evaluation Team expanded qualitative data collection to include calls during the extension period (October 1, 2017 – March 31, 2018) and expanded feedback on data collected to include calls in the evaluation reporting period (beginning April 1, 2018). Face-to-face meetings substituted for the implementation calls when the Evaluation Team conducted evaluation site visits.

### Site Visit Interviews

The Evaluation Team conducted three in-person site visits, one in June 2016, another in April 2017, and a final visit in May 2018 after the end of the period of performance extension.<sup>28</sup> The interim site visits focused primarily on progress, successes, and challenges with CCCC implementation. The final site visit, in May

---

<sup>27</sup> The project launch meeting, a data source identified in the Evaluation Plan submitted to USDOL, took place at the start of the grant period. Since CCCC was still very early on in development, the project launch meeting served to better clarify understandings of the evaluation for CCCC staff and to better identify approaches the Evaluation Team could use to provide real-time feedback and information to CCCC, rather than answer research questions.

<sup>28</sup> When USDOL granted CCCC a six-month grant implementation extension, the Evaluation Team shifted the final site visit from the end of Program Year 3 (September 2017) to after the extension period (May 2018). This shift allowed the Evaluation Team to better capture grant progress made during the extension as well as during the later portion of the original grant implementation period.

2018, focused on themes and issues that had emerged throughout the three years of implementation as well as program sustainability and lessons learned.

During the site visits, the Evaluation Team conducted individual and small group interviews using customized interview facilitation guides developed for each visit. Interviews were semi-structured with a majority being open-ended questions and probing, coupled with conversational inquiry. In line with the principles of applied thematic research, this interview approach allowed interviewees to speak about experiences in their own words, free of the constraints imposed by fixed-response questions. Inductive probing allowed the Evaluation Team to clarify statements, meanings, and feelings associated with experiences. This promoted evaluator accuracy in capturing detailed observational notes and evaluator learning from participant’s word-choice and descriptions.<sup>29</sup>

The Evaluation Team received tours of and conducted interviews at the AMT hangars (training program location) in Plymouth, the CCCC Main Campus in Barnstable, and on-site with AMT employers. The evaluators also conducted phone interviews when participants were unable to meet in-person. Stakeholder groups interviewed during the site visits are outlined in *Table A2*.

Table A2 | Implementation Evaluation Stakeholders

Stakeholder	Description
CCCC Leadership	The Evaluation Team conducted semi-structured 30-60 minute individual interviews with CCCC leadership including the President; the Vice President of Academic and Student Affairs; the Dean of Science, Technology, Mathematics, Business and Workforce Education; the Dean of Enrollment Management and Advising Services; the Director of Grants; the Director of Institutional Research and Planning; and the Grant Compliance and Research Analyst. These interviews focused on program activities and integration, collaboration, resources, lessons learned, and sustainability.
AMT Staff	Semi-structured 30-60 minute individual interviews were held with the grant’s AMT staff including the AMT Program Director, Student Retention Specialist, Administrative Assistant, Student Success Coach, and Hangar Manager. Interviews took place with all of the AMT staff who were at the college during the time of the visit and focused on implementation, challenges, successes, and lessons learned.
AMT Faculty	Semi-structured 30-60 minute individual and group interviews were held with AMT full-time and part-time grant faculty during each of the site visits. These interviews focused on progress, challenges, successes, and recommendations for strengthening the program.
AMT Participants	The Evaluation Team held semi-structured 20-30 minute group interviews with grant participants. During the April 2017 site visit, the Evaluation Team conducted cohort-based interviews, interviewing Cohort 1 (September 2016 start) and separately Cohort 2 (January 2017 start). Discussions focused on individuals’ goals, program experience, and overall program feedback.
Employers & Partners	Semi-structured 60 minute individual and group interviews were held with regional employers. During the first site visit, the Evaluation Team conducted a group interview with a larger employer who had been heavily engaged in AMT program discussions. During the second site visit, the Evaluation Team interviewed a smaller employer engaged in the AMT program. Discussions focused on program engagement, anticipated impacts to the business/organization, and overall satisfaction.

<sup>29</sup> Guest, Greg, MacQueen, K.M., and Namey, E.E. *Applied Thematic Analysis*. Thousand Oaks, CA. SAGE Publications, Inc., 2011.

To increase consistency of the interviews, the Project Lead was present for all site visits and participated in phone interviews, implementation calls, program document reviews, and report writing. This consistency helped build and preserve institutional knowledge across site visits. In addition, at least two Evaluation Team members were present for each site visit; this allowed one member of the Evaluation Team to focus on facilitation and a second member to take detailed notes. These site visit methods are consistent with recommendations made by qualitative researchers.<sup>30</sup>

## Student Survey

To supplement site visit interviews, the Evaluation Team in collaboration with CCCC administered feedback surveys to all participants in Cohorts 3 and 4 in June 2018. Completion of the survey was optional and focused on the following open-ended questions:

- What do you like best about this program?
- If there was one thing you could change about the program, what would it be?
- Describe the most helpful student services support you have received.

## Student Forms

To support data collection for the evaluation and USDOL reporting, CCCC in collaboration with the Evaluation Team modified and developed new student data forms. These forms provided valuable student data for both the Outcome Evaluation (see *Appendix B*) and the Implementation Evaluation. Key Implementation Evaluation-related forms for student data collection included:

Table A3 | Student Form Data

Form	Description
Initial Individual Services Plan (ISP)	Data for this form was collected at student intake and included questions such as: How did you hear about the AMT program? What interests you most about the program? What are your expectations for the program?
Exit Interview Form	This interview took place between an AMT staff member (e.g. Student Retention Specialist) and a student as the student was exiting the program. During or immediately following the interview the AMT staff member would complete the form for the Exit Interview. Questions in this form included: Did the AMT program influence your decision to continue your education? Why or why not? Did the AMT program influence your employment choice? Why or why not?
Follow-Up Survey Form	This follow-up interview took place after an individual exited the program. Data collected within this form included questions like: If yes to having a job in the aviation maintenance field, please rate how well the AMT program prepared you for your current job. Did you learn skills during the AMT program that are applicable to your current job? If yes, please describe the skills that have been most applicable. What additional skills would have been helpful to learn?

<sup>30</sup> Kidd, P.S. & Parshall, M.B. (2000). *Getting the focus and the group: enhancing analytical rigor in focus group research*. *Qualitative Health Research*, 10(3), 293-308.

## Program Document Reviews

The Evaluation Team reviewed program documents received from CCCC, including:

- Quarterly Narrative Progress Reports (QNPRs) created by CCCC to USDOL
- Annual Performance Report (APR) Table 1s created by CCCC to USDOL
- AMT feedback from external parties (e.g. USDOL monitoring visit)
- Student Retention Specialist tracking tools
- CCCC promotional and descriptive materials (e.g. brochures, equipment donations)

These documents provided additional context and information to evaluate program implementation. Context from these documents informed questions for the implementation calls and site visits and informed content within the evaluation reports.

## Analysis Methods

A general inductive thematic approach<sup>31</sup> was used to analyze the qualitative data generated from the interviews. This approach was selected because of its usefulness in drawing clear links between research questions or objectives and data collection results, and because it provided a theoretical foundation for subjective meaning to be interpreted and extrapolated from discourse.<sup>32</sup> The analytical framework used for the analysis included a time-dependent gradient (before the program and changes occurring in each year of program implementation) and a program-dependent gradient (analyzing program components).

Units of analysis included the programs, CCCC leadership, AMT staff, AMT faculty, participants, and program partners.

Emerging themes were then developed according to the analytical frame and through a review of (1) notes taken during implementation calls; (2) milestone summaries resulting from the implementation calls; (3) detailed notes taken during the site visits; (4) CCCC documents; and (5) the Evaluation Team's extensive experience with technical training programs and the body of evaluation knowledge built through their work. Guidance about what was important came from the grant narrative, research questions, and calls that had occurred throughout the grant period. Following this initial theme development, additional Evaluation Team members reviewed the results, adding contextual details and examples. These themes were divided into the following categories:

- *Interim Progress* – Documentable steps that had been taken to advance or achieve grant outcomes, deliverables, milestones, and/or goals;
- *Accelerators/Strengths of Progress* – Factors that had enhanced grant progress and improved the ability of grant staff to carry out grant initiatives, focused on internal factors (program design, modification, implementation, and application);
- *Barriers/Challenges to Progress* – Persistent difficulties grant staff had faced in accomplishing grant initiatives;
- *Recommendations* – Opportunities the Evaluation Team identified for improving progress toward grant outcomes (in Interim Report and quarterly summaries, where applicable); and
- *Sustainability* – Components of the program that will continue once funding ends.

---

<sup>31</sup> Thomas, D.R. (2006). *A general inductive approach for analyzing qualitative evaluation data*. *American Journal of Evaluation*, 27, 237-245.

<sup>32</sup> Guest, Greg, MacQueen, K.M., and Namey, E.E. *Applied Thematic Analysis*. Thousand Oaks, CA. SAGE Publications, Inc., 2011.

The results were again compared to the analytic frame and the anticipated reporting elements. The final step in the analysis was to send the summarized results to CCCC’s Grant Compliance and Research Analyst who personally reviewed the report and followed up with key stakeholders, such as CCCC and AMT leadership and faculty, to fact check and gather additional contextual details.

To strengthen the accuracy and credibility of implementation study findings, the Evaluation Team relied on triangulation and collaborative inquiry. By comparing findings based on different data sources and using approaches that incorporated both evidence and negative evidence, the Evaluation Team created a robust and dynamic depiction of implementation.<sup>33</sup> By presenting findings to CCCC stakeholders for elaboration, corroboration, and modification, the Evaluation Team confirmed and updated analyses. Additionally, by sharing findings with intended users as they emerged, the Evaluation Team built a collaborative relationship with stakeholders that encouraged higher quality first-person data and increased the likelihood the evaluation could produce timely, user-relevant findings.<sup>34</sup>

## Reporting

Data were interpreted, analyzed, and included in (1) quarterly milestone summaries completed throughout the grant implementation period; (2) interim evaluation reports (October 2016 and September 2017) and (3) this final report, finalized by September 30, 2018. The interim and final reports contain the results of the analysis, recommendations for program enhancements (interim only), and lessons learned. An in-depth review of these reports was conducted by CCCC’s Grant Compliance and Research Analyst, with support from CCCC leadership and AMT staff for member checking, factual verification, and elaboration on findings and recommendations. Subsequently, an interim and the final report were submitted to the USDOL by CCCC.

## Limitations

Limitations for the Implementation Evaluation included the following main elements:

**Partial and Biased Findings** – Qualitative and perceptual research methods offer good insights, but are, by nature, partial and biased. To attempt to address this limitation, the Evaluation Team took advantage of an opportunity embedded in mixed-methods evaluation, the triangulation of data. Triangulating results from multiple sources, such as comparing findings among stakeholder interviews and with documents reviewed, creates more credible evaluation results and is considered critical to the validity and reliability of findings. Findings that have been corroborated through triangulation tend to be sufficiently robust and credible.<sup>35</sup>

---

<sup>33</sup> Brewer, J. and A. Hunter. *Foundations of Multimethod Research: Synthesizing Styles*. Thousand Oaks, CA: Sage, 2006.

<sup>34</sup> Cousins, J.B. and Earl, L. M. (1992) *The Case for Participatory Evaluation*. *Educational Evaluation and Policy Analysis*, 14(4), 397-418.

Cousins, J.B. and Whitmore, E. (1998) *Framing participatory evaluation*. *New Directors for Evaluation*, 80. 5-23.

Greene, J. G. (1998) *Stakeholder participation and utilization in program evaluation*. *Evaluation Review*, 12. 91-116.

Reineke, R. A. (1991). Stakeholder involvement in evaluation: Suggestions for practice. *American Journal of Evaluation*, 12, 39-44.

Sturges, K.M. (2013). *Building consensus in (not so) hostile territory: Applying anthropology to strategic planning*. *Practicing Anthropology*, 35, 1: 35-39.

<sup>35</sup> Denzin, N.K. *The research act: A theoretical introduction to sociological methods* (2<sup>nd</sup> edition). New York, NY: McGraw-Hill. 1978.

Harry, B., Sturges, K.M., & Klinger, J.K. (2005). *Mapping the process: An exemplar of process and challenge in grounded theory analysis*. *Educational Researcher*, 34, 2: 3-13.

Patton, M.Q. (2001). *Evaluation, Knowledge Management, Best Practices, and High Quality Lessons Learned*. *American Journal of Evaluation*. 22(3). 329-336

Patton, M.Q. *Qualitative Research & Evaluation Methods* (4<sup>th</sup> edition). Thousand Oaks, CA: SAGE Publications, Inc.. 2015.

**Selection Bias** – To address the threat of non-response and non-consent, and to improve the likelihood that sufficient data could be collected to draw valid conclusions, the Evaluation Team relied on employer sampling coordinated by program staff. This approach introduced selection bias into the findings. Employers more interested in providing feedback or more involved in the program may have chosen to participate in interviews at a higher rate than less-interested or less-engaged employers, and program staff responsible for coordinating interviews may have selected only those cases where they anticipated favorable responses to interview questions. Neutral and constructive feedback from employers, however, supported the notion that these participants were chosen primarily for their willingness to participate in the evaluation rather than the likelihood that they would cast the program in a favorable light.

**Respondent Order Effect** – For the April 2017 site visit, the Evaluation Team conducted a group interview for Cohort 1 students and another group interview for Cohort 2 students. During the group interview, participants more interested in sharing their opinions of the program may have spoken up at a greater rate than other students. This may have created a pecking order bias by participants self-selecting their response order (i.e. certain participants go first and others go last). Receiving a range of feedback from participants, from positive to constructive, supports the notion and that a spectrum of student experiences was captured, however, it is possible that bias related to the participant response ordering was introduced into the evaluation.

**Researcher Extrapolation** – Analysis conducted with an interpretive analytical framework could result in researcher extrapolation and interpretation going too far beyond what is present in, and supported by, data.<sup>36</sup> Indeed, the recommendations provided in this report are based on a combination of what was learned and supported by data and the experiences and findings of the evaluators' previous experience designing, implementing, and evaluating various workforce development programs.

**Human Error** – The Evaluation Team relied on grant staff to collect and track much of the quantitative data used within the Implementation Evaluation (i.e. participant tracking) as well as qualitative participant data from student exit interview forms and follow-up student surveys. Human error and competing priorities could lead to imperfect and delayed data entry and tracking, which impacts the validity of the analysis. To mitigate this as much as possible, CCCC's main point of contact for the evaluation, the Grant Compliance and Research Analyst, had a strong background in research methodology and data collection. This individual oversaw data collection for the grant and coordination with AMT staff, such as the Student Retention Specialist, who were responsible for administering student data collection approaches (e.g. exit interview forms). This dedication to maintaining high-quality data tracking and reporting through staffing the grant with an individual experienced in data collection and reporting was a strength of the program's implementation and has likely led to decreased human error within the data. However, there may still be data imperfections with the data tracking.

---

<sup>36</sup> Guest, Greg, MacQueen, K.M., and Namey, E.E. *Applied Thematic Analysis*. Thousand Oaks, CA. SAGE Publications, Inc., 2011.

# Appendix B: Outcome Evaluation Methods

Methodological and design conversations concerning the Outcome Evaluation began at the onset of the project. Throughout the life of the grant implementation, the Evaluation Team continued discussions with CCCC around appropriate quantitative designs, using insight from the Implementation Evaluation and analysis from test data pulls to guide the conversation. Originally, the Evaluation Team planned on conducting an Impact Evaluation using a quasi-experimental design that employed a short interrupted time series (SITS) approach. The goal of using this methodology was to determine the efficacy of the AMT program in improving wages and employment for students exposed to the program. A key factor to choosing the SITS methodology was because a suitable comparison group for the AMT program was not available, due to the uniqueness of the AMT program at CCCC. However, as highlighted in the *Implementation Evaluation*, the program took longer to start-up than originally anticipated, and this led to fewer AMT student cohorts. Due to the small sample size, the lack of a comparison group, and the irregular information provided for a number of the outcomes (e.g. follow-up employment information), the Evaluation Team shifted the quantitative analysis to focus on an outcome-only evaluation.

This Outcome Evaluation focuses on descriptive and basic inferential statistical analyses, such as calculation of means, and disaggregations by different groups. Test data pulls were performed to observe data coding, missingness, and other patterns that might affect the analysis. The final data set included information from 69 participants from four cohorts. The data provided is as of the date the data was pulled, mid-May 2018.

It is important to note that an updated data file may be used by CCCC in the college's final report to USDOL. As such, data points such as employment data for completers may differ. In addition, the terms used in this analysis will not necessarily correspond with the specific USDOL ETA TAACCCT Outcome definitions. For example, for the TAACCCT reporting to the USDOL, completion was defined in the reporting guidelines (p. 9) as "having earned all of the credit hours (formal award units) needed for the award of a degree or certificate in that program of study. Participants should only be included once, even if they complete multiple programs."<sup>37</sup> To gather a more comprehensive understanding of how students were progressing in the AMT program, the Evaluation Team defined completion as earning a Certificate of Completion, which included completing the aviation coursework and FAA clock hours within that module (i.e. General, Airframe, Powerplant).

Finally, this Evaluation Report considers completion beyond the March 2018 period of performance, in order to give a fuller range of information available about the AMT program. As a result, students in Cohort 2 who completed their AMT program in April 2018 are considered as completers in this report but will not be reported as completers by CCCC to USDOL.

---

<sup>37</sup> United States Department of Labor Employment and Training Administration (2012). *Trade Adjustment Assistance Community College and Career Training Grants: Annual and Quarterly Program Reporting Forms & Instructions Rounds 2, 3 and 4*. Retrieved from [https://www.doleta.gov/taaccct/pdf/taaccct\\_round2\\_handbook.pdf](https://www.doleta.gov/taaccct/pdf/taaccct_round2_handbook.pdf)

## Research Questions

Table B1 summarizes the research questions examined through the Outcome Evaluation, including ties to data sources and analysis methods. Further details on data sources and collection plans, analysis methods, and potential limitations of the Outcome Evaluation are detailed in subsequent sections.

Table B1 | Outcome Evaluation Research Questions

Research Questions	Data Sources	Analysis Methods
1. To what extent do outcomes differ between cohorts?	<ul style="list-style-type: none"> <li>• Administrative data from CCCC</li> <li>• Supplementary form</li> <li>• SRS</li> <li>• Questionnaires</li> <li>• Exit and follow-up surveys</li> </ul>	<ul style="list-style-type: none"> <li>• Descriptive analysis</li> <li>• Basic inferential statistics and effect sizes</li> </ul>
2. To what extent do outcomes differ within cohorts? a. How do student outcomes differ by subgroup?	<ul style="list-style-type: none"> <li>• Administrative data from CCCC</li> <li>• Supplementary form</li> <li>• SRS</li> <li>• Questionnaires</li> <li>• Exit and follow-up surveys</li> </ul>	<ul style="list-style-type: none"> <li>• Descriptive analysis</li> <li>• Basic inferential statistics and effect sizes</li> </ul>

## Data Sources & Collection

Data came from a variety of sources, including CCCC administrative data, student intake forms, and exit surveys. This information was collected throughout the life of the grant by administrative staff at CCCC and not the Evaluation Team. Additionally, data from the different sources was matched for each student and deidentified (i.e. Personally Identifiable Information was removed) by CCCC.

Data conversations continued throughout the grant period so that CCCC and the Evaluation Team were in agreement about the type of information that would be collected. A practice data pull was performed in January of 2018 to give the Evaluation Team an understanding of the fields available, which helped determine the most appropriate statistical tests, given the research questions.

The final data pull was completed in mid-May of 2018 and the data was sent to the Evaluation Team in June of 2018 through a secure file sharing site. In addition to the data, the CCCC Grant Compliance and Research Analyst created a codebook to help the Evaluation Team understand the specifics of each field. CCCC did not distinguish information by APR period as they did with USDOL. As such, information provided in the final file did not exactly correspond with the specific USDOL outcome definitions.

Data for the Outcome Evaluation came from the following sources:<sup>38</sup>

**Existing Administrative Data** – Data was available through CCCC’s central data system, Jenzabar. Final data for this analysis was pulled in mid-May 2018. Examples of administrative data fields include enrollment dates, gender, race, program-related titles, and completion information.

**Supplementary Forms** – CCCC used supplementary forms, including a student intake form, to gather additional student information. These forms were completed by the Student Retention Specialist, or other AMT staff, in collaboration with the AMT students. Examples of data fields from this source include employment status prior to enrollment and hours worked prior to enrollment.

<sup>38</sup> All final data collection forms used by CCCC will be available on *SkillsCommons*: <https://www.skillscommons.org/>

**SRS-Program Coded Roster & Graduate Reporting Systems** – Information from the student reporting system (SRS) and graduate reporting systems was also collected. Examples of data fields from this source include cohort number, completion status, and FAA test completion. For FAA testing completion/pass variables, the following coding was available: *Yes* (if it was known for certain the test was taken and passed), *No* (if it was known for certain the test was taken and the person did not pass), *Unknown* (if the person was eligible to take the test, but there was no information about whether the test was taken and the result), and *Not attempted* (if the person had not yet met the requirements to take the test). For FAA credentials, *Yes* or *No* codes were used for simplification. If the credential was received, it was a *Yes*. All others were a *No*.

**Other Questionnaire Responses Prior to Exit/Follow-up** - This data included the Individual Service Plan, Meet & Greets, or other interviews. Examples of data fields from this source include information on how the student heard about the program.

**Exit Survey** – The Exit Survey was administered to all students leaving the program through graduation or otherwise. Exit data was collected at the point when the cohort should have completed the AMT base program, even if the student dropped out prior. Examples of data fields from this source include reason for exit, employment at exit, and whether the student plans to continue their education. This approach to exit data was different from USDOL ETA’s definition for TAACCCT completers. Only exit data for Cohort 1 and 2 was available for the Outcome Evaluation. Questions about the AMT program influencing the employment choice were not part of the exit interview for Cohort 1. There were only 3 reentry students, all from Cohort 1. Exit information is reported at the final point of exit. Reentry students were coded so that their exit information was combined with the other exit information. Two reentry students exited due to attendance reasons, but then reentered.

**Follow-up Survey** – This data was collected between May and June 2018 for Cohorts 1 and 2. Data from the second follow-up is anticipated to be collected August-September 2018 and a third follow up is anticipated to take place in December 2018-January 2019. These anticipated second and third data collection points were not included in the analysis but may be incorporated into CCCC’s final data report to USDOL. There was a small sample size ( $N \leq 10$ ) for the follow-up data, so the Evaluation Team could not perform any additional analysis. Examples of data fields from this source include employment status at follow-up and whether the student’s job is within the AMT field.

Student data from the Airframe and Powerplant modules were entered if the cohort had already enrolled and begun courses in that program at the time the data was pulled (mid-May 2018). All cohorts had Airframe program data, but only Cohorts 1 and 2 had Powerplant data. For the AAS program, data was recorded if a student had either completed the degree or was actively enrolled in the degree. Date of enrollment for AAS will be the same as initial date of enrollment since the aviation modules are required for that degree.

Variables that address employment or continuing education in the quarters following students’ exit were only asked of Cohorts 1 and 2 since they were the only groups that would theoretically be in full-time employment related to the AMT field. AMT course data was only provided for those courses that students would have been required to register for, as of the date of the data pull. Course variables that the students had yet to register for were left blank in the data file.

For completion of the modules, the completion variables were recoded. If students withdrew, failed, or did not complete, then they were recoded as not completing. If the student was still in progress, did not enroll, or the information was not available they were recoded as missing. It should be noted that the contexts by which certain students were coded as missing differed. If the student did not reach the specific module yet, then the data was not applicable. However, for other students if time had passed and no data was present it was missing due to inability to collect information.

## Missing Data

CCCC defined missing information through codes in the dataset sent to the Evaluation Team. These codes were used across the different data fields. When results were reported as missing, they could be for any of the following reasons:

- Unknown/not disclosed/not available/none
- Not applicable/not employed/still enrolled in program/did not enroll
- Data missing /not attempted
- Missing/Null

In general, these missing categories were not exclusive for one type of data source (e.g. only administrative data had not applicable codes). Since the sample size was so small, disaggregating these different types of missing categories would have potentially identified students. Additionally, using multiple missing categories could lead to confusing interpretations of the results. As such, the Evaluation Team coded all of these different categories as missing in general for the analysis.

## Outcomes

The following table shows the outcomes that were collected for each cohort.

For the evaluation, completion was defined differently than what was reported to the U.S. Department of Labor (USDOL). Therefore, the results in this report will be different than results submitted by CCCC to USDOL. For the TAACCCT reporting to the USDOL, completion was defined in the reporting guidelines (p. 9) as “having earned all of the credit hours (formal award units) needed for the award of a degree or certificate in that program of study. Participants should only be included once, even if they complete multiple programs.”<sup>39</sup> For a student to be counted as a completer, the individuals needed to earn all credits required for a college degree or certificate.

To gather a more comprehensive understanding of how students were progressing in the AMT program, the Evaluation Team defined completion differently. For this report, completion was defined as earning a Certificate of Completion, which included completing the aviation coursework and FAA clock hours within that module (e.g. General, Airframe, Powerplant). The Evaluation Team analyzed completion of FAA clock hours by AMT program, completion of FAA credentials, and completion of college certificates, if applicable.

---

<sup>39</sup> United States Department of Labor Employment and Training Administration (2012). *Trade Adjustment Assistance Community College and Career Training Grants: Annual and Quarterly Program Reporting Forms & Instructions Rounds 2, 3 and 4*. Retrieved from [https://www.doleta.gov/taaccct/pdf/taaccct\\_round2\\_handbook.pdf](https://www.doleta.gov/taaccct/pdf/taaccct_round2_handbook.pdf)

Table B2 | Outcomes Collected by Cohort

Outcomes Available	Cohort			
	1	2	3	4
<b>Expected Program Completion Date</b>	<b>Oct 2017</b>	<b>Apr2018</b>	<b>Dec 2018</b>	<b>May 2019</b>
<b>Academic Performance</b>				
Cumulative AMT GPA	X	X	X	X
<b>Passing CCCC AMT Component Courses</b>				
<b>General Module</b>				
AMT101- General 1	X	X	X	X
AMT102- General 2	X	X	X	X
<b>Airframe Module</b>				
AMT201 <sup>a</sup> - Airframe 1	X	X	X	
AMT202 <sup>b</sup> - Airframe 2	X	X		
<b>Powerplant Module</b>				
AMT203- Powerplant 1	X	X		
AMT204- Powerplant 2	X	X		
<b>Receiving CCCC Certification</b>				
Airframe Certificate <sup>c</sup>	X	X		
Powerplant Certificate	X	X		
AMT AAS Degree	X	X		
<b>Passing FAA Tests</b>				
General Written <sup>d</sup>	X	X	X	X
Airframe Written	X	X		
Airframe O&P	X	X		
Powerplant Written	X	X		
Powerplant O&P	X	X		
<b>Receiving FAA Certification</b>				
Airframe <sup>e</sup>	X	X		
Powerplant	X	X		
<b>Employment After Graduation</b>				
Employment	X	X		
Wages	X	X		

Note. X = data was available for this cohort

<sup>a</sup> Cohort 4 was enrolled in AMT 201 at time of data transmission

<sup>b</sup> Cohort 3 was enrolled in AMT202 at time of data transmission

<sup>c</sup> Cohort 3 did not have a chance to earn the College Airframe Certificate yet, because the cohort was finishing Airframe on 6/20/18

<sup>d</sup> Cohort 3 and 4 could have the opportunity to take the FAA General Written, but no other FAA tests at the time of the data pull.

<sup>e</sup> Cohort 3 and 4 would not have been able to earn the FAA Airframe certificate yet.

## Analysis Methods

### Measurements

The independent variables included:

- Cohort
- Demographic variables (e.g. gender, race/ethnicity)
  - Race was recoded to white and other races (i.e. not white) since there were so few students who were of other races besides white.
- Pell grant eligibility
- Veteran status
- Previous employment/wages (3-12 months prior)

Outcomes (dependent variables) included:

- Cumulative AMT GPA: This variable included GPA for the AMT program *only*. GPA is weighted, and the General AMT courses have less weight than later courses (i.e. Airframe and Powerplant). The Evaluation Team did not use GPA as a primary dependent variable because this measure was not comparable across the different cohorts as cohorts were at different points in progressing through the AMT modules (which had different weights). Cohorts 1 and 2 completed the 6 courses, where the GPA for Cohorts 3 and 4 are based on the 2 General courses. At the time of data delivery, Cohort 3 was finishing Airframe and Cohort 4 was starting Airframe.
- Passing CCCC AMT Component Courses (AMT101, AMT102, AMT201, AMT202, AMT203, AMT204)
- Receiving CCCC Certification (Airframe, Powerplant, AAS AMT Degree)
- Passing FAA tests (General Written, Airframe Written, Airframe O&P, Powerplant Written, Powerplant O&P)
- Receiving FAA certification (Airframe, Powerplant)
- Employment/wages after graduation

Though employment and wage outcomes were a central feature of the TAACCCT evaluations, there was not enough information collected in which to perform analyses. Furthermore, employment and wage information were largely self-reported. As a result, the analyses for this study focused on academic outcomes (e.g. completion).

### Statistical Analysis

Because of the small sample size, amount of missingness for select outcomes, and lack of comparison group, the Evaluation Team limited their analysis to an outcomes-only study. The analysis focused on frequencies and percentages, as these provide useful information about student outcomes. Descriptive data was separated by categories (i.e. disaggregated) as appropriate, including disaggregations by cohort. These results allowed for further understanding of the types of individuals who participated in CCCC's AMT program, and potential between- and within-group differences.

Power analyses were performed to determine if certain statistical tests could be conducted. Because of the small sample size and amount of missing data, more robust statistical analyses (i.e. inferential statistics such as chi-square tests, logistic regression, etc.) could not be performed.<sup>40</sup> The achieved power for these tests was well below the recommended threshold. Though more robust statistical analyses could not be performed, a number of rudimentary statistical tests were conducted (i.e. t-test for independent samples, Spearman correlation<sup>41</sup>), if an acceptable power threshold was achieved. These tests can be used when the data does not meet the strict assumptions for the more complex statistical tests. As such, the inferences drawn from these statistical tests are more limited. To supplement these findings, effect sizes were also computed, as appropriate, which helped substantiate any statistically significant results from these tests. Effect sizes are useful for understanding if the statistically significant results are practically relevant. They also serve as an additional safeguard to fallacious *p*-values insofar as they are indifferent to significances that may result from sample size.

IBM SPSS Statistics<sup>42</sup> was used for all statistical analyses, and G\*Power<sup>43</sup> was used for power calculations.

## Limitations

Limitations for the outcome analysis included the following:

### Data Considerations

**Sample Size** – As mentioned elsewhere in the report, the sample size in this study was small. As such, the statistical analysis was limited because there was not enough statistical power. The conclusions drawn from the statistical analyses are narrow and relevant for these four cohorts of AMT students who provided information.

**Self-Reported Data** – Since the exit and follow-up employment information were largely self-reported, the Evaluation Team cannot be certain about the reliability of the data. However, some employment information was collected via AMT faculty and/or retention staff with companies where they had regular communications.

### Threats to Internal Validity

**Claims of Causality** – Because the Evaluation Team could not isolate all of the effects of the grant program through this outcomes design, we *cannot make claims* that the AMT program *alone* contributed to the outcomes.<sup>44</sup> Due to the small sample size, we were not able to control for background characteristics or isolate treatment effects. As a result, the results presented in this report are only descriptive in nature and cannot be attributed solely to the AMT program. Any inferences made from the statistical results should be taken with caution.

**Historical Effects** – Some alternative event or innovation that happens concurrent with program implementation may be motivating the observed change, but the change is attributed (mistakenly) to

---

<sup>40</sup> Power analyses were performed, and the sample size was much less than what would be considered necessary to have adequate power for statistical tests (i.e.,  $\beta=0.80$ ).

<sup>41</sup> The Spearman correlation was chosen over the Pearson correlation coefficient because one of the variables in the test was skewed (i.e., AMT GPA).

<sup>42</sup> IBM Corp. (2018). IBM SPSS Statistics for Windows, Subscription Service. Armonk, NY: IBM Corp.

<sup>43</sup> Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G\*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, 41, 1149-1160.

<sup>44</sup> Gertler, P.J., Martinez, S. Premand, P., Rawlings, L.B. & Vermeersch,, C.M.J. (2011). *Impact Evaluation in Practice*. Washington DC: The International Bank for Reconstruction and Development/The World Bank.

the intervention. This is of particular concern because of the variability and influence that greater economic conditions have on the outcomes of interest. The availability of jobs changes over time; what may look like a program impact (or absence of one) could be entirely or partly the result of changing conditions outside the AMT Program. Since we have no external comparison group that is experiencing the counterfactual condition at the same time, we cannot rule out the possibility that these effects are influencing our outcome of interest.

**Selection Bias** – The AMT program was not designed for selective enrollment, or random assignment of students into the program, meaning selection bias inherently exists. Selection bias is common in any form of design that does not involve random sampling or random assignment. Selection bias can occur in the enrollment process when the individual student self-selects to enter the program, and there is no systematic mechanism for how participants enroll in a program. Selection bias could distort inferences to the larger population, as there might be some underlying characteristics for why these students entered the program.<sup>45</sup> This is a limitation of our design that we acknowledge. Thus, the Evaluation Team can only make inferences from this sample to the larger population of people that would have similar demographics, experiences, skills, and motivations to the participants in this study.

**Measurement Error** – The Evaluation Team was unable to obtain individual-level UI wage data. As such, the Team must rely entirely on self-reports of pre- and post-program employment status where measurement error could reduce the accuracy of attempts to estimate the effects of the program. Participants may misreport their employment status for prior quarters because they cannot recall this information, fail to accurately remember, or they feel compelled to respond inaccurately for some other reason. This could bias the resulting estimate if this error is systematic or it could just introduce additional unnecessary variance if the error is random.

## **Threats to External Validity**

**Unique Program Features and Timing** – The duration of the program and length of the grant period prevents the Evaluation Team from observing employment outcomes for a portion of the AMT students, limiting the statistical power of the ability to detect effects. This may result in a type II error, in which the Evaluation Team incorrectly infers no change when one exists (but may be too small to detect).

---

<sup>45</sup> Gertler, P.J., Martinez, S. Premand, P., Rawlings, L.B. & Vermeersch,, C.M.J. (2011). *Impact Evaluation in Practice*. Washington DC: The International Bank for Reconstruction and Development/The World Bank.

# Appendix C: Outcome Evaluation Tables

## Background Characteristics

Table C1 | Student Background Characteristics by Cohort (N=69)

	Total	Cohort			
		1	2	3	4
<b>Total Number</b>	<b>69</b>	<b>21</b>	<b>18</b>	<b>19</b>	<b>11</b>
<b>Gender</b>					
Female	<b>10 (14.5%)</b>	* (9.5%)	*3 (16.7%)	* (15.8%)	* (18.2%)
Male	<b>59 (85.5%)</b>	19 (90.5%)	15 (83.3%)	16 (84.2%)	9 (81.8%)
<b>Race<sup>a</sup></b>					
White	<b>48 (69.6%)</b>	16 (76.2%)	13 (72.2%)	15 (78.9%)	* (36.4%)
Not-white	<b>20 (29.0%)</b>	5 (23.8%)	5 (27.8%)	* (21.1%)	6 (54.5%)
Missing	<b>* (1.4%)</b>	0 (0.0%)	0 (0.0%)	0 (0.0%)	* (9.1%)
<b>Mean Age</b>	<b>27.6</b>	29.6	26.6	25.3	29.6
<b>Pell-Grant Eligible</b>					
Yes	<b>17 (24.6%)</b>	5 (23.8%)	6 (33.3%)	* (5.3%)	5 (45.5%)
No	<b>52 (75.4%)</b>	16 (76.2%)	12 (66.7%)	18 (94.7%)	6 (54.5%)
<b>Veteran</b>					
Yes	<b>12 (17.4%)</b>	* (9.5%)	* (16.7%)	* (21.1%)	* (27.3%)
No	<b>57 (82.6%)</b>	19 (90.5%)	15 (83.3%)	15 (78.9%)	8 (72.7%)
<b>Has Disability</b>					
Yes	<b>* (5.8%)</b>	* (9.5%)	0 (0.0%)	* (5.3%)	* (9.1%)
No	<b>62 (89.9%)</b>	17 (81.0%)	17 (94.4%)	18 (94.7%)	10 (90.9%)
Missing	<b>* (4.3%)</b>	* (9.5%)	* (5.6%)	0 (0.0%)	0 (0.0%)

\* Number masked since n<5

<sup>a</sup> Race was recoded to white and other races (i.e. not white) since there were so few students who were of other races besides white.

Table C2 | Prior Education and Employment Characteristics by Cohort (N=69)

	Total	Cohort			
		1	2	3	4
<b>Total Number</b>	<b>69</b>	<b>21</b>	<b>18</b>	<b>19</b>	<b>11</b>
<b>Highest Level of Education</b>					
High School Diploma or Equivalent	<b>55 (79.7%)</b>	16 (76.2%)	15 (83.3%)	15 (78.9%)	9 (81.8%)
Associate Degree or Higher	<b>14 (20.3%)</b>	5 (23.8%)	* (16.7%)	* (21.1%)	* (18.2%)
<b>Employment Prior to Enrollment</b>					
<i>At Time of Enrollment</i>					
Yes	<b>40 (58.0%)</b>	10 (47.6%)	13 (72.2%)	14 (73.7%)	3 (27.3%)
No	<b>29 (42.0%)</b>	11 (52.4%)	5 (27.8%)	5 (26.3%)	8 (72.7%)
<i>3 Months Prior to Enrollment</i>					
Yes	<b>60 (87.0%)</b>	20 (95.2%)	15 (83.3%)	17 (89.5%)	8 (72.7%)
No	<b>9 (13.0%)</b>	* (4.8%)	* (16.7%)	* (10.5%)	* (27.3%)
<i>6 Months Prior to Enrollment</i>					
Yes	<b>56 (81.2%)</b>	18 (85.7%)	15 (83.3%)	16 (84.2%)	7 (63.6%)
No	<b>12 (17.4%)</b>	* (14.3%)	* (11.1%)	* (15.8%)	* (36.4%)
Missing	<b>* (1.4%)</b>	0 (0.0%)	* (5.6%)	0 (0.0%)	0 (0.0%)
<i>9 Months Prior to Enrollment</i>					
Yes	<b>53 (76.8%)</b>	17 (81.0%)	14 (77.8%)	15 (78.9%)	7 (63.6%)
No	<b>14 (20.3%)</b>	* (19.0%)	* (16.7%)	* (21.1%)	* (27.3%)
Missing	<b>2 (2.9%)</b>	0 (0.0%)	* (5.6%)	0 (0.0%)	* (9.1%)
<i>12 Months Prior to Enrollment</i>					
Yes	<b>53 (76.8%)</b>	17 (81.0%)	13 (72.2%)	16 (84.2%)	7 (63.6%)
No	<b>14 (20.3%)</b>	* (19.0%)	* (22.2%)	* (15.8%)	* (27.3%)
Missing	<b>* (2.9%)</b>	0 (0.0%)	* (5.6%)	0 (0.0%)	* (9.1%)

\* Number masked since n&lt;5

## Findings from the Outcome Evaluation

### Research Question 1: Patterns Between Cohorts

Table C3 | Completion Status by Cohort (N=69)

	Total	Cohort			
		1	2	3	4
Program Completion Date		Oct 2017	Apr2018	Dec 2018	May 2019
<b>Total Number</b>	<b>69</b>	<b>21</b>	<b>18</b>	<b>19</b>	<b>11</b>
Completed Full Program (General, AF, PP)	<b>33 (47.8%)</b>	17 (81.0%)	16 (88.9%)	0 (0.0%)	0 (0.0%)
Completed Airframe Instruction Only	<b>* (1.4%)</b>	* (4.8%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Completed Powerplant Instruction Only	<b>0 (0.0%)</b>	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Still Enrolled in Program	<b>25 (36.2%)</b>	0 (0.0%)	0 (0.0%)	17 (89.5%)	8 (72.7%)
Non-Completer/Not Enrolled in Program	<b>10 (14.5%)</b>	* (14.3%)	* (11.1%)	* (10.5%)	* (27.3%)

*Note.* Three students left but reentered the program, with their reentry outcome used in the table above. Completion was defined as earning a Certificate of Completion, which included completing the aviation coursework and FAA clock hours within that module (i.e. General, Airframe, Powerplant).

\* Number masked since n<5

Table C4 | Post-Completion Outcomes by Cohort (N=34)

		Total	Cohort	
			1	2
Graduation Date			Oct 2017	Apr2018
Total Number of Completers		34	18	16
<b>Planning to Continue Education at Exit Survey</b>				
Yes	22 (64.7%)	11 (61.1%)	11 (68.8%)	
No	9 (26.5%)	5 (27.8%)	* (25.0%)	
Missing or N/A	* (8.8%)	* (11.1%)	* (6.3%)	
<b>Employed at Exit Survey</b>				
Yes	21 (61.8%)	8 (44.4%)	13 (81.3%)	
No	11 (32.4%)	9 (50.0%)	* (12.5%)	
Missing or N/A	* (5.9%)	* (5.6%)	* (6.3%)	
<b>Employed in AMT Area at Exit Survey</b>				
Yes	6 (17.6%)	* (16.7%)	* (18.8%)	
No	15 (44.1%)	5 (27.8%)	10 (62.5%)	
Missing or N/A	13 (38.2%)	10 (55.6%)	* (18.8%)	
<b>Planning to Continue Education at Follow-Up</b>				
Yes	* (11.8%)	* (11.1%)	* (12.5%)	
No	* (5.9%)	* (11.1%)	0 (0.0%)	
Missing or N/A	28 (82.4%)	14 (77.8%)	14 (87.5%)	
<b>Employed at Follow-Up</b>				
Yes	7 (20.6%)	* (22.2%)	* (18.8%)	
No	* (5.9%)	* (5.6%)	* (6.3%)	
Missing or N/A	25 (73.5%)	13 (72.2%)	12 (75.0%)	
<b>Employed in AMT Area at Follow-Up</b>				
Yes	* (8.8%)	* (16.7%)	0 (0.0%)	
No	* (2.9%)	0 (0.0%)	* (6.3%)	
Missing or N/A	30 (88.2%)	15 (83.3%)	15 (93.8%)	

Note: In the table above, anyone who responded as “No” or “Missing or N/A” to the question of *Employed at Exit* or to the question of *Employed at Follow-Up*, were automatically categorized as “Missing or N/A” in the follow-up question of *Employed in AMT Area at Exit* or *Employed in AMT Area at Follow-Up*. Completer totals include the one student who completed Airframe portion (but not Powerplant) and all other students who completed the full AMT program. Successful completion of Airframe was included as a completer because the AMT program was designed as a stackable program. Completion was defined as earning a Certificate of Completion, which included completing the aviation coursework and FAA clock hours within that module (i.e. General, Airframe, Powerplant).

\* Number masked since n<5

## Research Question 2: Patterns within Cohorts

Table C5 | Cross Tabulations of Highest Level of Education and Completion (N=39)

		Highest Level of Education		t-Statistic	Cohen's <i>d</i> (Effect Size)
		HS Diploma or Equivalent (N=31)	Associate or Bachelor's Degree (N=8)		
<b>Complete CCCC Airframe Certificate</b>					
Yes	<b>15 (61.5%)</b>	9 (29.0%)	6 (75.0%)	2.51*	0.99
No	<b>24 (38.5%)</b>	22 (71.0%)	2 (25.0%)		
<b>Complete CCCC Powerplant Certificate</b>					
Yes	<b>14 (35.9%)</b>	8 (25.8%)	6 (75.0%)	2.77*	1.08
No	<b>25 (64.1%)</b>	23 (74.2%)	2 (25.0%)		
<b>Complete FAA Certification Airframe</b>					
Yes	<b>13 (33.3%)</b>	9 (29.0%)	4 (50.0%)	1.11	0.42
No	<b>26 (66.7%)</b>	22 (71.0%)	4 (50.0%)		
<b>Complete FAA Certification Powerplant</b>					
Yes	<b>13 (33.3%)</b>	9 (29.0%)	4 (50.0%)	1.11	0.42
No	<b>26 (66.7%)</b>	22 (71.0%)	4 (50.0%)		
<b>Complete Certificate Program (Airframe and Powerplant, or Airframe Only)</b>					
Yes	<b>34 (87.2%)</b>	28 (90.3%)	6 (75.0%)	-0.89	-0.40
No	<b>5 (12.8%)</b>	3 (9.7%)	2 (25.0%)		

Note. All students either had either a HS diploma or equivalent (GED or HS Certificate of Completion), or an associate or bachelor's degree. FAA completion is self-reported. Cohorts 1 and 2 were the only cohorts with data on these completion outcomes. Completion was defined as earning a Certificate of Completion, which included completing the aviation coursework and FAA clock hours within that module (i.e. General, Airframe, Powerplant).

Effect size: Small=0.20; Medium=0.50; Large=0.80<sup>46</sup>

\* $p < .05$

<sup>46</sup> Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2<sup>nd</sup> ed). Hillsdale, NJ: Lawrence Earlbaum Associates, 2.