

# Safety21

INNOVATING SAFETY FOR ALL

The National University Transportation Center for Promoting Safety

**Carnegie Mellon University**



*Advancing Transportation Safety and Workforce Development in  
Emerging Technologies*

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Community College of Philadelphia

FINAL RESEARCH REPORT

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**16. Abstract**

This project enabled three separate areas of the transportation workforce to receive valuable training. The areas taught Advanced Driver Assist Systems for transportation technicians, Electrical Vehicle accident concerns for public safety workers, and electric vehicle repair and diagnosis training for entry level transportation technicians. As a workforce generator and continuing education provider in the Philadelphia region the college felt these 3 areas needed expert level training opportunities. Each area was well received and the college plans to expand these opportunities.

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The Community College of Philadelphia is a workforce generator for the City of Philadelphia and its surrounding regions. The current state of the transportation technician workforce is in huge decline. Currently According to a study by TechForce Foundation, there will be a **shortage of approximately 642,000 technicians (automotive, diesel, and collision) in the industry by 2024.**

The shortage is expected to worsen, despite strong demand. The issue is not only getting young people interested in the industry, but also keeping the ones that are new to the industry<sup>4</sup>

As vehicles become more sophisticated, there is an argument that the sensors and computerized systems that reduce maintenance mean qualified auto repair professionals are more in demand. The latest federal job outlook shows a slight decline over the next eight years. But other studies show a shortage of qualified and highly skilled auto repair workers "increasing in severity" by 2024.

"Although demand is strong, with 642,000 auto/diesel/collision techs needed between 2020 and 2024, the shortage continues to worsen. The good news is these careers have been considered essential by the government, and the transportation industry is organizing to do something about the shortage," says Jennifer Maher, the CEO of [TechForce](#), an industry-supported nonprofit that champions careers as auto technicians.

The workforce began shrinking about 15 years ago, around the time high schools started cutting trade-type classes such as auto shop because of funding limitations, among other downward trends, says Chuck Searles, president of the Automotive Management Institute, which provides industry-recognized credentials.

"Kids do not tinker on their cars in the backyard like they used to. The interest is not as far reaching," he adds. "There is still a hot rod and racing culture, but not as it was in the '70s, '80s, and '90s." Having started as a service technician himself and working his way up to a corporate level job, Searles says he knows first-hand the opportunities available to those interested in the industry.

The past couple of decades have been a "quantum change" he says, especially when it comes to the perception of the job. ("Today's autotechnicians are not just mechanics, they ... - WorkingNation")

When it comes to repairing cars currently, a “technician” is a trained professional with postsecondary and factory training. A “mechanic is trained by their father or people around them.”

This information has pointed the Community College of Philadelphia into developing some ideas to help the current and future workforce around some of the high-tech areas of the automobile including Advanced Driver Assistance Systems and high demand for technicians skilled in electric vehicle diagnosis and repair.

We also thought with the increased sales of Hybrid and Electric vehicles there should be more training to help first responders with how to handle a vehicle accident that involves those vehicles.

The college worked with our advisory committee and developed a 3-part workforce training program.

#### PART 1 Advanced Driver Assistance System Training

Advanced Driver Assistance Systems (ADAS) deliver some of the most popular and important onboard safety features on modern vehicles.

They use cameras and sensors found around the vehicle to scan the surrounding environment, find emerging hazards, and deliver warnings or corrective maneuvers to reduce the risk of collision.

Some of the most well-known ADAS-powered safety features include:

- Lane & position correction
- Autonomous Emergency Braking (AEB)
- Pedestrian & hazard detection
- Blind spot monitoring
- Adaptive cruise control

ADAS systems rely on precise calibration of their cameras and sensors to accurately scan and detect potential vehicle hazards.

These sensors can easily be knocked out of position if you are

involved in a collision (even a minor bump) or if your vehicle undergoes repairs to its panels, wheels, suspension, or even its windscreen.

If this happens, ADAS-powered safety features could stop working, or intervene when they are not needed, posing risks to vehicle safety.

It is therefore critical that ADAS calibration is checked and corrected in full if there is even a small chance they may have been disrupted.

What happens if ADAS is not calibrated properly?

Failure to calibrate ADAS properly can lead to serious implications for drivers and their vehicles, including:

- Critical safety features will not work properly

If ADAS sensors are not calibrated correctly, then the vital safety features that rely on them will not work properly. This could mean that warnings and interventions do not activate when they are needed most, potentially increasing the risk and severity of an incident.

- The vehicle may not work at all

Some ADAS features may render your vehicle completely unusable if they are not calibrated properly. Features like autonomous braking may prevent the vehicle from moving if sensors cannot pick up the surrounding environment, due to their line of vision being blocked or impeded.

- It could pose real dangers to driver safety

If miscalibration causes ADAS to malfunction while you are driving, the system may activate interventions or corrective maneuvers when they are not needed. In extreme cases, this could cause your vehicle to swerve or brake unexpectedly, posing serious risks to both drivers and other road users.

This was a sign of need for technicians in Philadelphia and surrounding areas.

When the college spoke with advisory committee members including Southeast Pennsylvania Transportation Authority, University of Pennsylvania Transportation department, Chapman Automotive group, City of Philadelphia Fleet Management Office and various independent service providers, we found that not many had a solid understanding of the importance behind Advanced Driver Assistance Systems and did not have access to good source of information or training. In the Summer 2023 before our grant started two faculty members from the college attended a 2-day intensive ADAS training program provided by Hunter Engineering. Armed with this information they shared their experience with the Advisory Committee and suggested offering a free training seminar for area technicians. The Advisory Committee suggested making this a two day program and having Hunter Engineering provide the training so not to disturb the college academic calendar.

The college worked with Thomas Kelley from Hunter Engineering to develop a curriculum and training schedule. We thought offering the training over two consecutive days would work best. January 22-23 our first cohort of 15 students were trained on how to diagnosis, replace and calibrate cameras, radar, lidar and other ADAS inputs. They learned the importance of an accurate alignment for a car to control a vehicle safely and accurately. They were shown how to conduct radar calibration using factory scan tools and targets. They showed ways to make sure the camera was aimed in the proper direction so it could properly warn a driver of an oncoming issue.

The second cohort was conducted on January 24 and 25 2024. All the students came from supporting members of our advisory committee companies. We were able to train 28 students in total. We have heard from the advisory committee that the technicians that attended have taking the information they learned back to their repair facilities to help other technicians in the repair center understand ADAS better which will help make our roads safer.





## Part 2 – First Responder Training – Chester County Public Safety Training

Adapting response plans through training, research, and experience is critical in the fire service. As sales of electric and hybrid vehicles increase, the fire service must continue to change tactics to properly respond and protect firefighters. Fighting vehicle fires is inherently dangerous. When responding to an electric or hybrid vehicle fire there are other challenges responding crews must consider.

Public Safety Departments should consider using these guides when tackling an electric vehicle fire.

[https://www.nfpa.org/education-and-research/emergency-response/emergency-response-guides#aq=%40culture%3D%22en%22&cq=%40taglistingpage%3D%3D\(%22EV%20Guides%22\)%20%20&numberOfResults=12&sortCriteria=%40title%20ascending](https://www.nfpa.org/education-and-research/emergency-response/emergency-response-guides#aq=%40culture%3D%22en%22&cq=%40taglistingpage%3D%3D(%22EV%20Guides%22)%20%20&numberOfResults=12&sortCriteria=%40title%20ascending)

Due to the need for training public safety departments and limited funding, the plan was set up to use AFV (Alternative Fuel Vehicle) Educate.

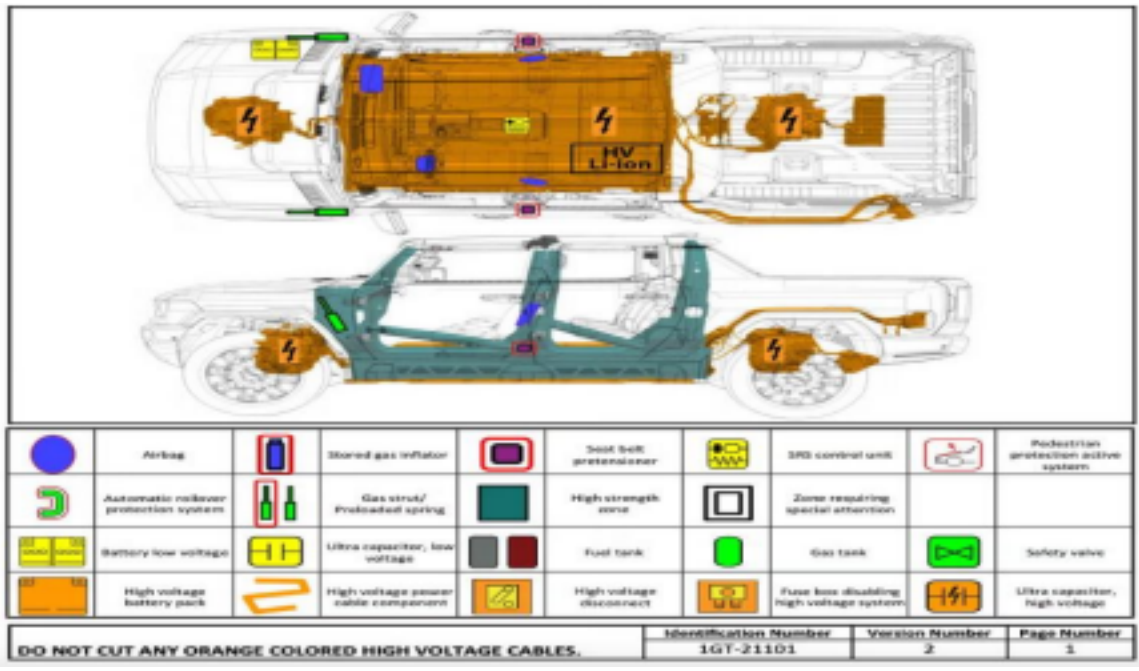
AFV Educate, a not-for-profit 501(c)(3) organization, has set its mission to develop and present training on modern technology vehicles to those who need it.



The Community College initially tried to schedule and help the Philadelphia Fire Department, but they had already scheduled their training sessions for the rest of the year and suggested we reach out to one of the surrounding counties to help them prepare for these events. So, the college was successful in creating a program for Chester County Public Safety department and scheduled 4 classes over a two-month period. These classes helped over 150 paid and volunteer emergency response workers.

The program consisted of:

- Understanding basic electrical theory, both Alternating Current and Direct Current
- Summarized how electric and hybrid electric vehicles operate
- Described the different types of electrified vehicles - Outline electric vehicle safety systems
- Categorized electric vehicle charging appliances and their safety systems
- Understanding electric vehicle identification techniques - Listing procedures for disabling and immobilizing electric and hybrid electric cars
- Illustrated the firefighter personal protective equipment recommended for EV response
- Outlined extrication procedures to be used when dealing with entrapments and EVs
- Understanding fire response and electrified vehicles.



This type of training should always be available for first responders who need it at no cost. It can save and protect the lives of many people.

Part 3 – Holding the first ALTF 101 Electric Drive class at Community College of Philadelphia.

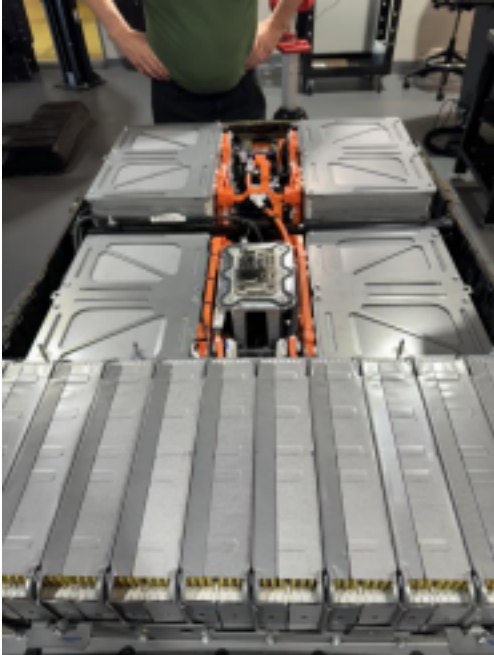
During the 2022-23 academic year the Community College of Philadelphia developed ALTF 101-Electric Drive Vehicles, a course

where students learn how to safely diagnose and repair vehicles with electric drive systems. Electric drive systems are a new and completely different means of propulsion, requiring a thorough understanding of motor control and high voltage electrical systems. Students learn the differences between various vehicle charging technologies and about issues concerning the current U.S. infrastructure supporting electric drive vehicles (power grids and charging stations). Students can also earn manufacturer certifications.

The course is paired with ALTF 102 Hybrid Vehicles to create the Alternative Fuels – Electric Drive and Hybrid Vehicles Proficiency Certificate which is meant for upskilling current technicians working in the automotive repair industry and graduates of transportation technology programs.

The college has just completed building a brand-new Career and Advanced Technology Center that created a large new training area for the transportation programs. The department was challenged with finding new instructors and created new manufacturer partnerships to help build our program. The college wanted to start this new ALT Fuels proficiency certificate and thought since there was a group of new graduates and alumni from the program, the college could offer this to our students and graduates. We offered the course and unfortunately only had 10 students register but felt this was an opportunity to run the course and be able to work closely with the students to fine tune the hands-on training course work.

In this course the students reviewed basic electrical principles, extensive time was taken to understand the safety requirements for working on these vehicles, removed the high voltage battery, inverter, and converter. Learned to test the onboard charging controller, the generator/motors and some work with high voltage leakage using an insulation tester and with a milliohm meter to see how extraordinarily little resistance can cause issues in a high voltage system that our regular 12-volt system will not even notice.



We found out a few things, for the graduates of our program the college needed to offer this program in the evening so it can correspond with their work schedule. The grant covered their tuition cost and safety equipment, specifically high voltage gloves and goggles, thinking more students would register but we found ones that did register were not always fully invested since they did not pay for the course.

Next time we will offer the program in the evening to meet the working technicians demands and require the students to bring their own safety gear. It will be a new tool for their toolbox.

The three programs we used our funding for have impacted on our program and our relationship with advisory committee partners. The transportation department has added new members of advisory committee after hearing about our innovative programs. The department is getting asked to provide more training for technicians, we are being asked by our students to incorporate this new course ALTF 101 Electric Drive vehicles course into our existing degree program and to run the next course ALTF 102 Hybrid Vehicles to complete the proficiency certificate. Other counties have asked if we can sponsor training for their public safety officers, so they are preparing for high voltage vehicle accidents.