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AND SKILL SETS
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NACAT NEWS

VOL 36

AUGUST 2022

NO.4



Allied Members

NACAT
NORTH AMERICAN COUNCIL
OF AUTOMOTIVE TEACHERS



ELECTUDE



TOPDON

NACAT

NORTH AMERICAN COUNCIL

OF AUTOMOTIVE TEACHERS

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NACAT News is Published SIX Times per Year!

DEADLINE DATES

October 2022 issue - September 10, 2022

December 2022 issue - November 10, 2022

February 2023 issue - January 10, 2023

April 2023 issue - March 10, 2023

June 2023 issue - May 10, 2023

August 2023 issue - July 10, 2023

The latest advertising size and rate information can be found at

www.nacat.org.

Officers

President

2021 - 2023

Tom Millard

Warren Tech
13300 W 2nd PL, Auto Tech BLDG C
Lakewood, CO 80228

Vice President / President Elect

2021 - 2023

Drew Barnes

Vale School District
403 E Street West
Vale, OR 97918

Secretary / Treasurer

2021 - 2022

Jim Voth

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Winnipeg, MB R3H 0J9

Appointments

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Sheri Hamilton / Heather Sebben

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Email: info@nacat.org

Office Phone: 913.703.7390

Executive VP for 2022 Conference

Laura Lyons

ATech Training
12290 Chandler Drive
Walton, KY 41094

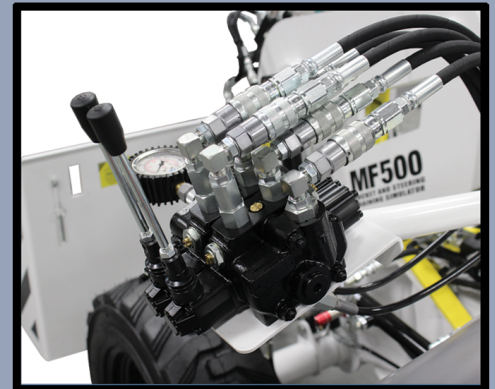
NACAT News Editor

James Curry

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108 Carolinian Drive
Summerville, SC 29485
Email: nacatnews@nacat.org

2022 Utah Business Innovation Award Winner

The Fluid Power Training Institute™ (FPTI™), located in West Valley City, UTAH, proudly acknowledges the model MF500-HTTS hydraulic training simulator as an award winner in the 2022 Utah Business Innovation Awards.



CALL US to setup a demonstration of this, and other FPTI™ products, via an online/virtual meeting.

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NACAT PRESIDENT'S UPDATE

TOM MILLARD

WARREN TECH

Greetings all,

The [NACAT Conference & Expo](#) is just days away at the time of this writing. I can't wait until we all get together to share all the changes that we have gone through, celebrate what we have accomplished, and discuss the trials and tribulations of life we need to learn from. For me it has been a great year of renewed feelings as to why I became an automotive instructor, and the changes that are coming our way.

The return to instructor training conferences helps me communicate with other instructors who attended the SkillsUSA NLSC in June, the ASE Conference in July, and who will now attend the [NACAT Conference](#) August 7th to the 11th. At these conferences we renew friendships, make new contacts, and help new teachers. We get a chance to understand that NACAT offers friends and mentors to all instructors, new and old, both north and south of the border. The training sessions are beneficial and help us keep our finger on the pulse of the future of the automotive industry. We further get the chance to share our opinions and experiences with other instructors and find out that we all have situations with our respective administrations that drive us crazy. Attending conferences also allows our families time to visit new sites while we interact at trainings and social activities in changing locations.

We have been adding more information on the [NACAT Facebook page](#). Members of the NACAT board are updating activities and events frequently. The page and the [NACAT website](#) have more information available to you on activities that members can chose to partake in while at the conferences.

One of our guest speakers at this year's conference is a great friend to NACAT. Jorge Menchu, of [AESWave](#), has agreed to join us. Jorge has led a very interesting life, has given a lot to instructors at previous events, and we feel honored to have him attend.

If you are a new teacher and have not attended a [NACAT Conference](#), I must iterate that this is one of the best opportunities available. NACAT is the organization which is truly educatorcentric: **For automotive teachers...By automotive teachers**. Visit the [NACAT website](#) to learn more. At the time of this publication, we have 7 days until we will be meeting again on August 7th thru the 11th of 2022.

Your NACAT officers and board are looking forward to future conferences. We are excited to share our 2023 Conference location at the [2022 Conference](#) during the Awards Dinner. You won't want to miss it!

I look forward to having the chance to speak with you in person. Our last opportunity, in 2019, seems so long ago. Safe travels, and I'll see you soon.



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K&N Engineering
1455 Citrus Street
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403 E Street West
Vale, OR 97918

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Aurora, CO 80011

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Stephen Tucker
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2 Main Street
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Board Member **2021 - 2024**

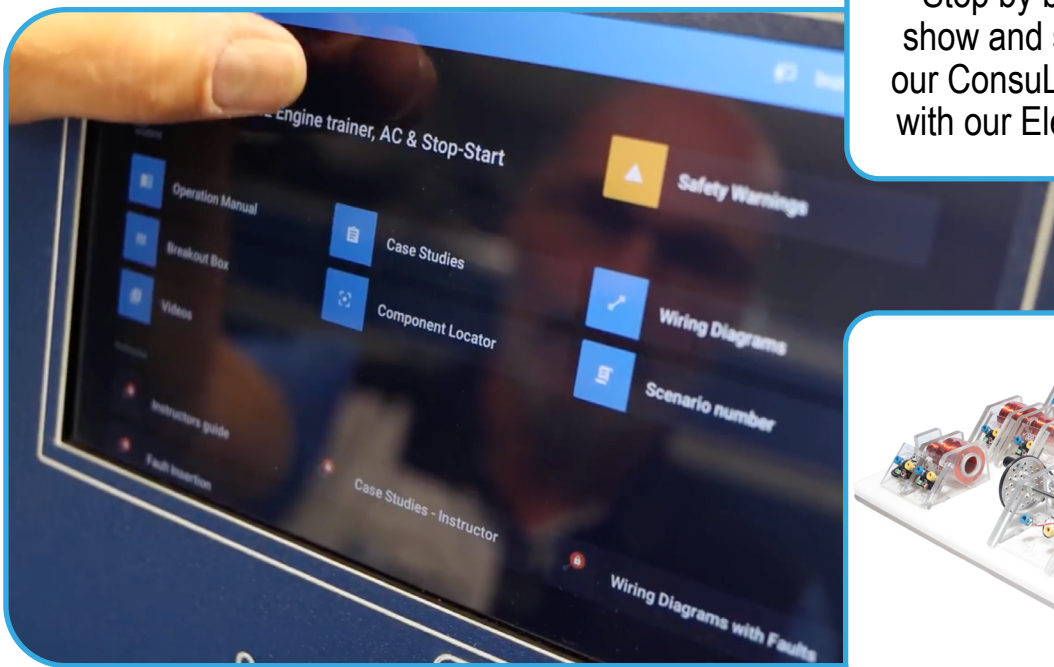
Louie Longhi
Mechanics Local 701 Training
450 Gunderson Drive
Carol Stream, IL

ConsuLab

TRAINING AIDS

We want to thank ATech for hosting this year's conference.

We look forward to seeing you all in person in Northern Kentucky/Cincinnati. Al Santini will be presenting on our behalf and we will also be showcasing all of our newest products during the showcase.



Stop by booth 5&6 at the trade show and see a demonstration of our ConsuLink engine bench along with our Electromagnetism trainer.



Did you know our own Jimmy Dinsmore is a Cincinnati native? Jimmy is excited to have so many familiar faces in his hometown. If you have any questions about the area, or need advice on where to eat or visit, contact him. His number is : 513-515-9448 and his email is jdinsmore@consulab.com.

Let Jimmy be your personal concierge during NACAT!





Getting To Know...

...Steve Gibson, NACAT Board Chair

LAND SPEED RACING

If you have ever met me, you'll know I have a strong passion for the sport of Land Speed Racing. This sport has carried me through many different stages of my life, relationships, injury, places of employment, and emotional status and never once has it let me down. Why exactly is that? I'm not 100% sure, but I'll do my best to share my experiences with the sport with you.

What exactly is Land Speed Racing? Think of it as the Guinness Book of World Records for vehicle speeds. There are classes for almost every form of vehicle imaginable. The goal for all competitors is to build a vehicle to be the fastest in its class. Sounds simple, right? There are *MANY* more challenges than you may realize! We will go into those challenges in a little bit. If you are fortunate to be one of the rare few people who are able to set a record, that is all that you get. We don't have "winners", there is no purse money paid out, your reward is your name on the record certificate. That makes Land Speed Racing completely passion driven and has also made the sport the last truly amateur form of motorsports left in the world. There are no corporate sponsorships and there is minimal media coverage. Most of the competition vehicles were built at home by the person driving them. There are so many unique and special nuances of the sport, it is very easy to become hooked. And of course, everybody wants to go fast! It has long been joked that auto racing started as soon as the second car was built; there are many accounts of daring people testing how fast they could go, dating back to the late 1800's, but the sanctioned sport of Land Speed Racing wasn't formed until 1938. A group of car clubs in Southern California joined forces to promote sanctioned racing events (and to discourage racing on public streets), forming the Southern California Timing Association or SCTA. Today SCTA is the largest and most well known sanctioning body for Land Speed Racing events.

I was first exposed to Land Speed Racing at 14 years old. A small group ventured out to El Mirage Dry Lake in Southern California to watch a family friend "race". I really had no concept of the type of racing I was about to see. I remember arriving on the dry lake bed and having to drive across it to the other end as that was where the racing took place. It was so flat and so smooth and it seemed like there was nothing around for as far as the eye could see. We arrived at the boundary of the race course and got out, waited, and watched. An announcer was calling out what vehicle was running, and then their speed on the CB radio. Finally our friend's car number was announced, and we stood and waited. Off in the distance to the west you could see a blue dot, the paint on the grille of his 1928 Ford roadster, with a con trail of dust growing behind it. The sound of the small block Chevy engine at 9000 rpm was absolutely amazing as the roadster pushed out a 190 mph run. Then all of a sudden there was no sound at all – dead silence – then the abrupt sound of the parachute deploying to help him get safely stopped from that speed. From that moment on, I knew this was something that I had to find a way to do myself.

Fast forward two years. I began working part time in an auto repair shop while in high school, thanks in part to this same family friend who also worked there as the service writer. I had helped rebuild an engine the summer before, but my automotive skills really started to grow while working in the garage. With my employment came the opportunity to work on my own vehicle using the professional-level equipment in the shop while being guided by the technicians who worked there. The opportunity to work on your own projects was a benefit offered to all the employees, as long as it didn't prevent the shop from doing the jobs that pay the bills. I continued working there through graduating high school and on through college as well.

CONTINUED ON PAGE 8



Steve Gibson with his Land Speed Racing car.

I gleaned a lot of knowledge from the techs and was able to put it to memory and to use working on my own vehicles (even my dirt bike). I had continued to attend Land Speed Racing events on my own as a spectator and had rarely missed a race. Just after I graduated high school, my friend sold his roadster and set forth on the journey of building a new one from the ground up. Building a race car is a long and tiresome project, so along the way my friend was “helping” another member of his car club to run his Camaro. I use “helping” cautiously because the owner of the Camaro gave my friend free reign to invest whatever changes he wanted to make into the car, as well as drive it in the events at El Mirage. That was just the generous personality he had. I arrived to work one hot July afternoon to find the Camaro hitched to the back of my friend’s truck, taking it home to prepare it for the race that coming weekend. I soon learned that the owner couldn’t make it to the race, and you need at least 2 people to be able to run a vehicle. I was ecstatic when I was invited to be the fill-in

crew for that weekend! Race day finally arrived and we set off for the dry lake bed very early in the morning so we could go through tech inspection as soon as it opened. We parked, unloaded the car, changed the tires (it couldn’t get on or off the trailer with the race tires on because it sat so low) and got it inspected. I was witnessing an entirely new side of the sport I had never been exposed to before. The inspectors crawled over every inch of the Camaro, checking for safety violations, following a lengthy checklist, and comparing to previous inspections recorded in the Camaro’s log book. Everything was in order, and we were allowed to file our entry form and to start preparing to make a run. We ended up making two runs that day, and even in the sweltering desert heat the Camaro logged two speeds of 178 mph and 177 mph. Not bad for 110 degree temperatures and a density altitude (temperature and barometric pressure corrected altitude) of almost 9,000 feet! I witnessed first hand how the air/fuel ratio needed by the engine can change because of variables like air density. I also learned about valve lash, something I really didn’t understand until I physically experienced it. We measured the lash cold, then warmed up the engine and measured it again and the lash had tightened almost 0.010”! We adjusted the lash based on the camshaft’s specifications. The detail involved was mesmerizing, and every adjustment and every detail had a purpose, and I couldn’t get enough of it.

I continued to help with the Camaro for the remaining 3 races of that season. Because of the consistent speeds the car would run, we were in a very tight points battle with another Camaro from the same car club. The season finale race arrived, and both cars were neck and neck, whoever left the race with the most points would be the season champion for the car club. The owner of the Camaro I was helping with was also able to come to the race, and he also was going to drive it for the last race of the season. We were getting the car ready to run that morning, and he looked over at me while I was torquing the lug nuts and said “You know, I’m really thankful for all the help you’ve given us this season. How’d you like to take a ride in this thing later today?” I couldn’t believe what I was hearing, and I’m told my eyes were as big around as the wheels on the car! “Uhh, ok?” was the only phrase I was able to utter. However, my friend stepped in and reminded us that I couldn’t drive as I was not a member of the car club. Dang it! Fortunately the owner was very smooth, and instantly came back with “well ok, then how about you come to some car club meetings during the off season, you can join the club and we’ll put you in the car next year!” And just like that my pulse took off like a drum line and I couldn’t wait for next season to arrive. As far as the current season, the final race ended melodramatically, the other Camaro blew up their engine and coasted the course with a final speed of 45 mph, while our Camaro blew up the transmission at the 2-3 shift, but we coasted through with a 66 mph speed and winning the club championship for that year. But it also meant that in order for me to race the next season, the car had to be fixed.

CONTINUED ON PAGE 16

Several key factors drive the Fluid Power Training Institute™'s (FPTI™) design team:



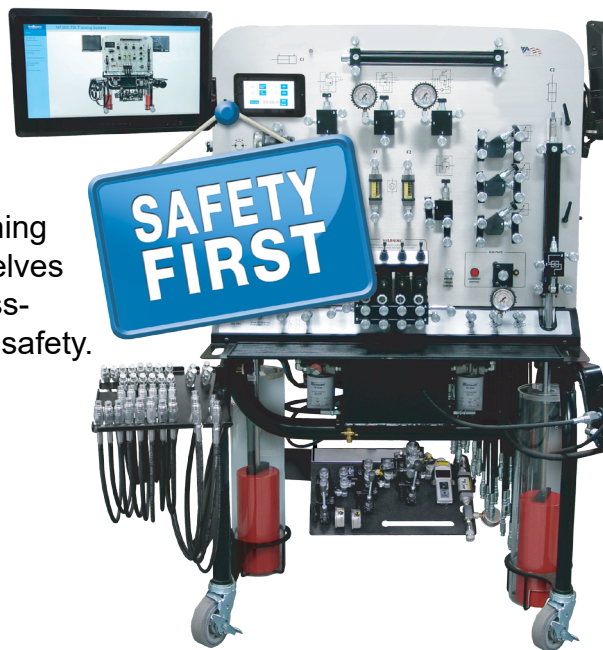
- Make sure students begin their careers with a clear understanding of fluid power safety.
- Teach skillsets that are desperately needed by industry.
- Prepare students for real-world troubleshooting.
- Make fluid power easy to teach, and fun, exciting, and easy to learn.

Safety -

The most valuable topic a teacher can teach his or her students is safety as it relates to the industry. The benchmark of every product FPTI™ builds is safety. Safety is also embedded in FPTI™'s unmatched curriculum. Students that graduate from colleges that use FPTI™'s training systems and comprehensive curriculum are not only themselves well prepared to work safely, but they become safety ambassadors for an industry that is sorely lacking when it comes to safety.

FPTI™'s training simulators are the safest in the world – no exposed shafts; no lethal springs for load; no exposed pulleys; no oil leaks; devices that make it possible to free a hydro-locked quick-disconnect non-invasively.

At FPTI™, we practice what our curriculum preaches!



Skillsets -

Study after study shows that every industry, whether it be manufacturing, construction, mining, forestry, military, etc., desperately needs technicians that are competent to service, maintain and troubleshoot hydraulic systems.

When it comes to maintenance and troubleshooting, FPTI™ is recognized as a world leader. As far as we know, FPTI™ hydraulic training simulators are the only simulators in the world that meet TAFE Australia's stringent fluid power learning objectives.

In addition, FPTI™'s Model MF102 is the only training simulator in the world that has the capability of making almost every hydraulic component "wear out" in real time without any instructor intervention. This feature makes it possible for students to learn how to test hydraulic pumps, pressure control valves, directional control valves, cylinders, hydraulic motors, etc., because the components are actually "defective."

The MF102 prepares students for real-world troubleshooting - *Here's an example:*

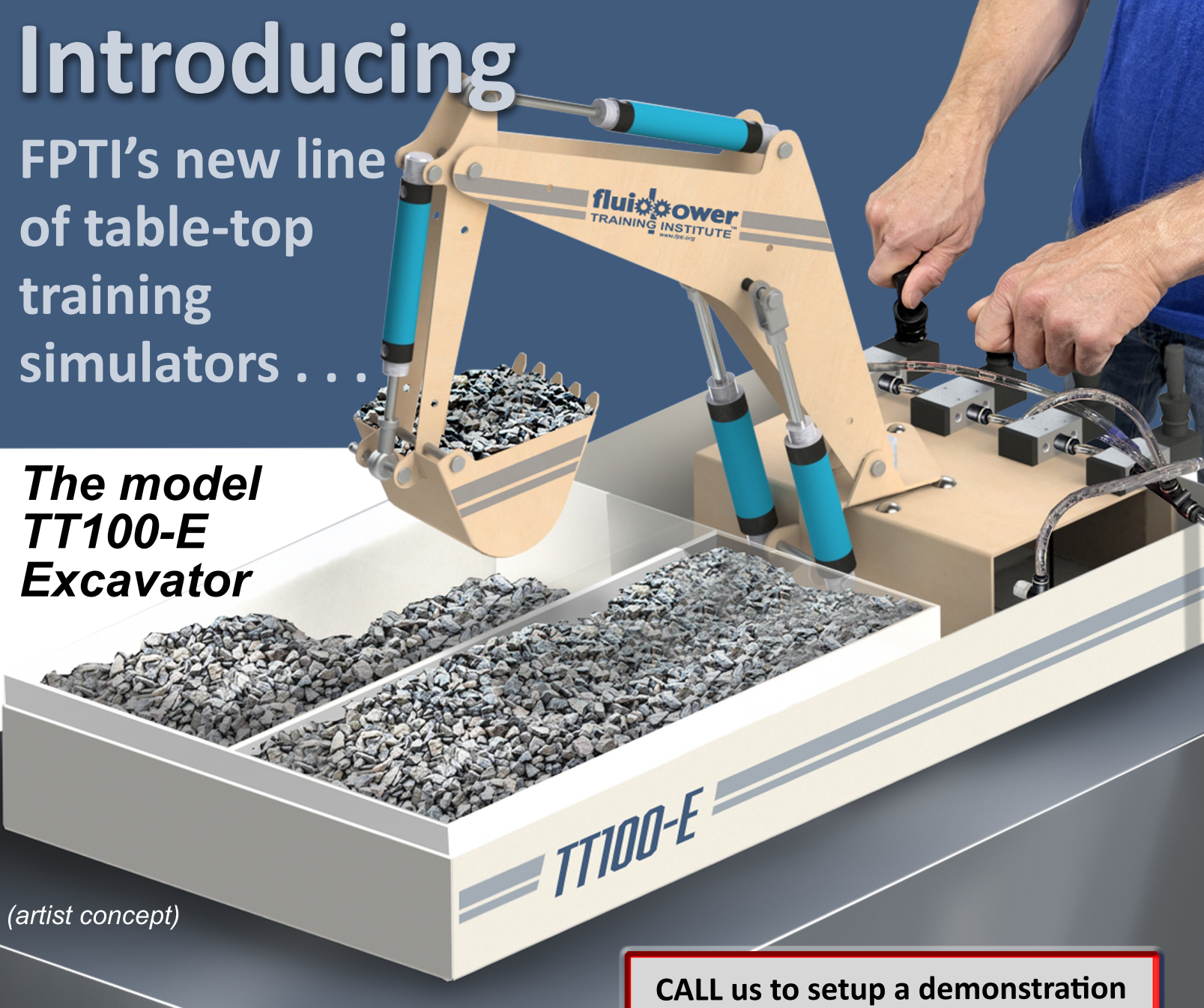
From the list of equipment, the student selects a front-end loader, which has a drifting bucket. The student constructs the loader's hydraulic system using the identical components as used on a front-end loader. Once the system is constructed, the student raises the load and finds that it holds. When the student selects the "NEXT" screen, the computer automatically creates a leak (in real time) in the lift cylinder or the directional control



Introducing

FPTI's new line
of table-top
training
simulators . . .

The model TT100-E Excavator



(artist concept)

- **Safe and clean** – operates at low pressure (max 60 PSI) with water.
- **Makes hydraulics fun and exciting to learn** – students assemble the excavator, fabricate, and install flexible lines, fill the transparent reservoir with water, and see hydraulics in action.
- **The fully functional excavator lets students load pebbles on one side of a hopper and deposit them in the opposite side.**
- **A pressure gauge and different cylinder sizes lets students grasp fundamental hydraulics as it relates to force, pressure, and area.**
- **COVID friendly** – students can learn hydraulics in the safety and comfort of their homes.
- **Perfect for mechatronics and STEM classes.**
- **Great for skills competitions.**
- **Water pump operates with 110 VAC.**

**CALL us to setup a demonstration
of this, and other FPTI products,
via an online/virtual meeting.**

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www.fpti.org

Follow us on:



You

NACAT

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Thank you to those who have either joined or renewed
their membership since June 1, 2022.

Jason Allen
Lafayette, IN

Daniel Davis
Delhi, NY

Milton Ayakawa
Waipahu, HI

Mark Lacasandile
Pearl City, HI

Michael Chicconi
Fresno, CA

Andrew Long
Trout Sale, OR

James Cokos
Sanford, FL

Nolan Miyahara
Pearl City, HI

Mark Davis
Sanford, FL

Eric Pang
Pearl City, HI

Azan Edoo
Sanford, FL

Kelton Taniguchi
Aiea, HI

Jeff Eligio
Pearl City, HI

Carlos Vasquez
Sanford, FL

New HEV, EV, FC Textbook



Written by Craig Van Batenburg with other contributing writers.



EMV

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Vehicle Technology

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- Plug-In Hybrid
- Electric
- Electric with Range Extender (EV-RE)
- Fuel Cell EV



- Scooters
- Motorcycles
- Automotive
- Light Duty Trucks & Busses
- Heavy Duty Trucks & Busses

Monthly Train-the-Trainer Classes

Education Support Program (ESP) was designed during Covid-19. In 2020/2021, ACDC had time to form a group of 5 Colleges to create a turn-key program. Educational Institutions of all types now have access to a well thought out program to deliver a comprehensive HEV-EV classes. To learn more, go to www.FIXEV.com and click on ESP. This may be what you were looking for. The Book is included in ESP plus alot more!

Craig@fixhybrid.com **508.826.4546**

www.fixhybrid.com

ROBINAIR AND MACS TO PROVIDE FREE SECTION 609 TRAINING AND TESTING TO UP TO FIVE HUNDRED TECHNICIANS THIS SUMMER



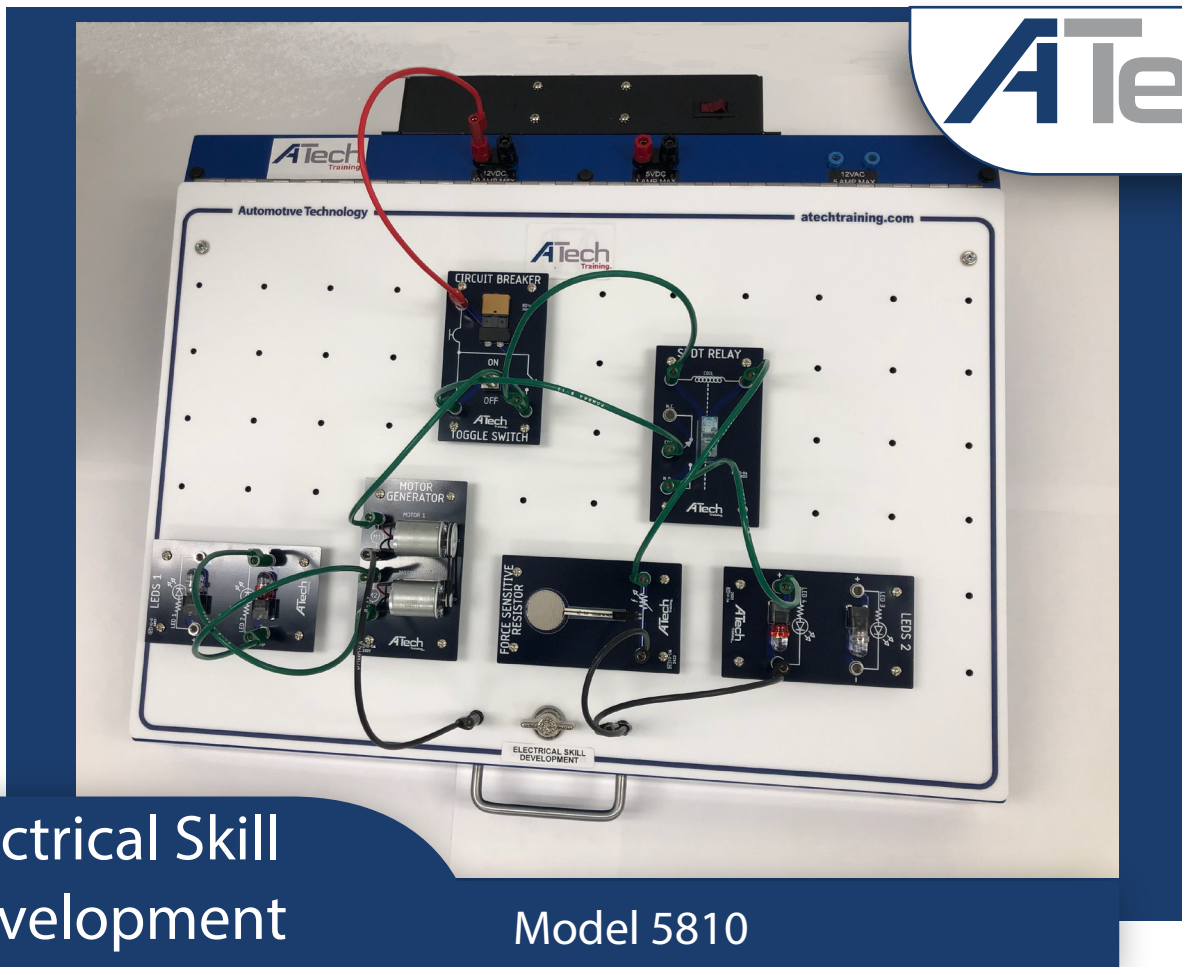
Robinair, a Mobile Air Climate Systems Association (MACS) member, is working with MACS to provide free Section 609 test prep webinars for training and certification for automotive technicians this summer on June 16, July 13, **August 17**, and **September 14**. Each class will be open to up to one hundred twenty-five automotive technicians. An EPA 609 certification allows industry professionals to understand and stay compliant with EPA guidelines in the handling and disposing of refrigerants. All technicians who

wish to purchase refrigerant in quantities over two pounds must be Section 609 certified and show their credential at purchase to be compliant with U.S. EPA regulations.

The webinars will be broadcast online and take approximately 90-minutes. After completing the 90-minute webinar, the attendee will be given an opportunity to take the online 609 certification test for free. A minimum score of 84% is required to become Section 609 certified to work on vehicles using R-12, R-134a or R-1234yf refrigerant.

"Robinair continues to work with MACS to offer up-to-date training, ensuring technicians provide high quality service," said Tim Wagaman, Senior Product Manager, Robinair. "Education on how to identify the different refrigerants, handle each one safely, and how to equip shops with the proper equipment is crucial as more R-1234yf vehicles join the road at a rapid pace. Using the wrong device can severely damage a vehicle's A/C system and may even damage the shop's A/C repair machine."

Interested technicians may register by calling (215) 631-7020, extension 313 or 311 or by registering online at the MACS website.



Electrical Skill Development

Model 5810

Electrical Skill Development (ESD) introduces electrical and electronic components mounted on submounts. Both serial and parallel circuits can be configured to perform the activities in the ESD courseware.



Features:

- Power Supply
- Submounts
- Patch Cords
- Submount Storage
- Courseware Included (Student Manual and Instructor Guide)

valve. Now, when the student raises the load, it drifts. The student then tests both the directional control valve and the cylinder. When the student finds the defective component, he or she simply touches the symbol on the touchscreen, and the problem “repairs” itself. There is no other trainer in the world that has this capability.

Make it easy, fun & exciting -

FPTI™ makes fluid power easy and rewarding to teach, and our training “system” makes fluid power fun and exciting for the students to learn.



FPTI™ Founder/Director
Rory S. McLaren

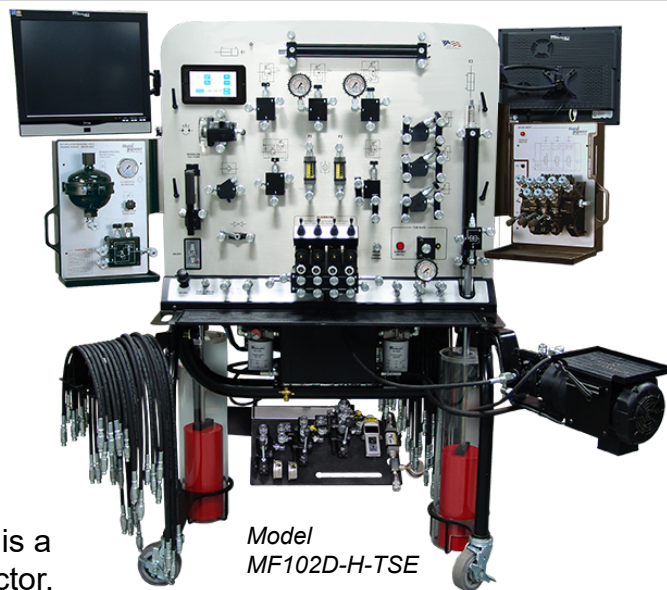
FPTI™’s founder, Rory McLaren, is a world-renowned hydraulics instructor, having taught in Africa, Australia, North and South America, UK, and the EU. His expertise is in hydraulic safety, maintenance, and troubleshooting. Who better to design hydraulic trainers, write textbooks, and develop curriculum, than the person that is a recognized expert by the very people that will be hiring your students?

In addition, Rory McLaren takes pride in personally teaching instructors through his train-the-trainer workshops, which are free to all instructors that teach at tax-payer funded schools, colleges and universities.

Students are in awe when they stand in front of FPTI™’s Model MF102 flagship trainer.

In the United States, young men and women grow up constantly being reminded that the U.S.A. is the most technologically advanced country in the world. When they stand in front of FPTI™’s Model 102 training system, it confirms that belief. It is vital therefore, for technical colleges to “market” to students, through their labs, and the presentation and quality of their simulators, that fluid power is one of the most rewarding careers they can pursue.

If you are interested in seeing the most advanced hydraulic, pneumatic, electro-hydraulic and electrical training systems in the world, we are eager to have a virtual showcase with you at your convenience. Send an e-mail to Matt Luers at matt@fpti.org to set up an appointment.



Model
MF102D-H-TSE



NACAT2022 *Agenda*

CONFERENCE & EXPO

Sunday August 7, 2022

[Registration \(click to register\)](#)

Welcome Reception

4:00pm - 7:00pm

7:00pm - 8:30pm

Monday August 8, 2022

Breakfast

Registration

Family Meeting

Membership Meeting and Keynote Speaker

Morning Refreshment Break

Continued: Membership Meeting and Keynote Speaker

Lunch

Training Sessions

Expo Setup PM

On Own

8:00am

8:00am - 11:30am

9:00am - 9:30am

9:00am - 10:30am

10:30am - 10:45am

10:45am - 12:00pm

12:00pm - 1:30pm

1:30pm - 3:00pm

2:00pm - 6:00pm

Evening

Tuesday August 9, 2022

1st Time Attendee Breakfast

Breakfast

Training Sessions

Morning Refreshment Break

Training Sessions

Lunch & Expo

Training Sessions

Afternoon Refreshment Break

Training Sessions

Family BBQ*

Valve Cover Races*

7:00am - 8:00am

7:30am

8:00am - 9:30am

9:30am - 10:00am

10:00am - 11:30am

11:30am - 2:30pm

2:30pm - 4:00pm

4:00pm - 4:30pm

4:30pm - 6:00pm

6:30pm - 8:00pm

8:00pm - 9:30pm

Wednesday August 10, 2022

Breakfast

General Session and Keynote

Expo

Lunch & Expo

Arrive at Ark Encounter

Training Sessions

Afternoon Refreshment Break

Training Sessions

On Own

7:30am

8:00am - 9:30am

9:30am - 1:00pm

12:00pm - 1:00pm

1:00pm

1:00pm - 2:30pm

2:30pm - 3:00pm

3:00pm - 4:30pm

Evening

Thursday August 11, 2022

Breakfast

Training Sessions

Morning Refreshment Break

Training Session

Lunch

Training Sessions

Afternoon Refreshment Break

Training Sessions

Dinner & Awards*

7:30am

8:00am - 9:30am

9:30am - 10:00am

10:00am - 11:30am

11:30am - 1:00pm

1:00pm - 2:30pm

2:30pm - 3:00pm

3:00pm - 4:30pm

6:00pm - 9:30pm

[*These events are available for an additional charge.](#)

Thank you to our sponsors!



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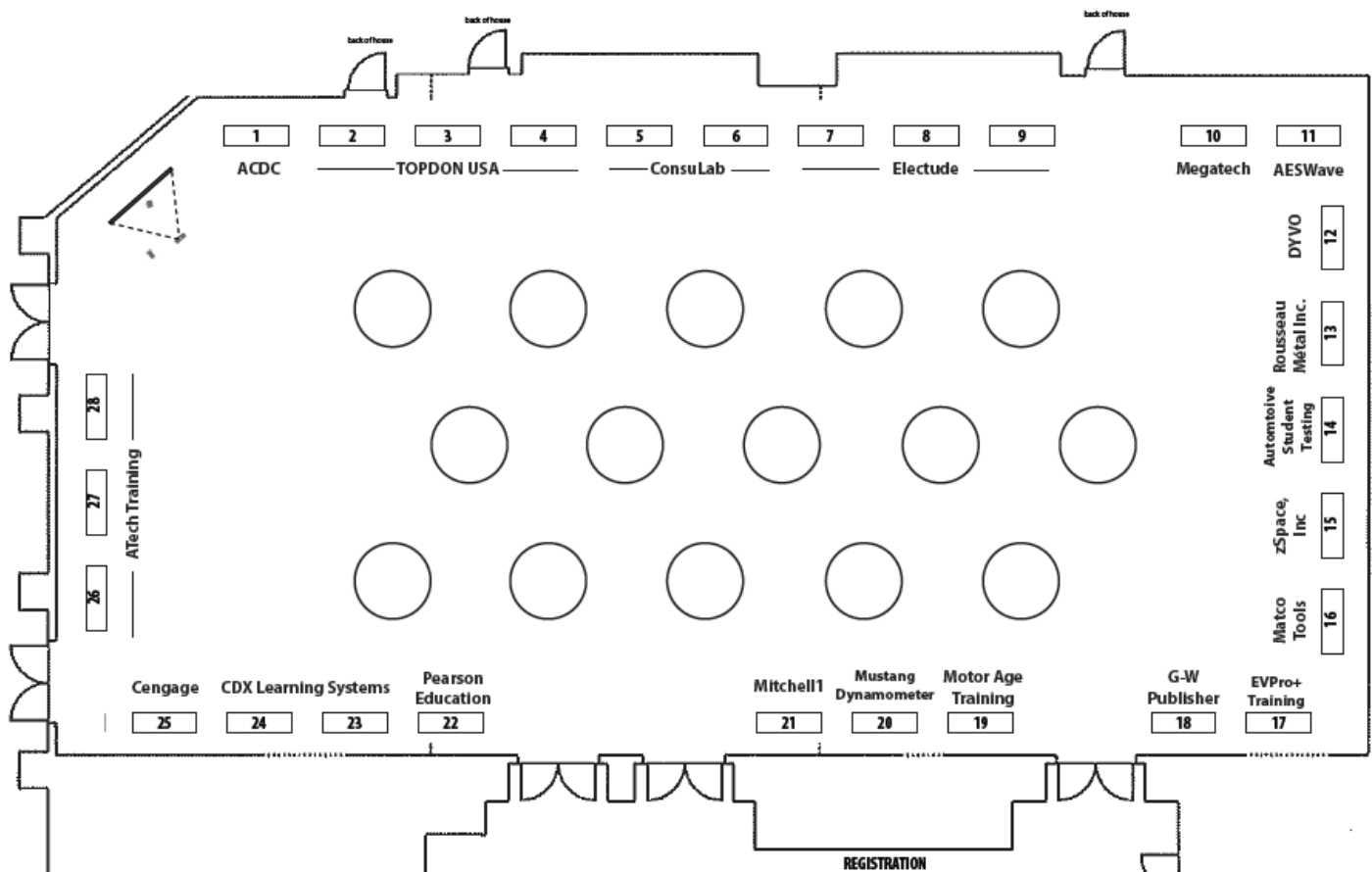
CONTINUED FROM PAGE 8

I didn't waste a moment. I began the next year attending the first three meetings of the Road Runners car club, and joined the club at the third meeting. The following week, we moved the Camaro from its owner's house to the shop I worked at. I was on Spring Break that week, so I spent my time on the Camaro. I pressure washed the whole thing to get rid of the oily mud underneath and pulled the transmission and the engine out of the car. Disassembly of the transmission revealed that the pump gear had broken. GM engineers probably never meant for that gear to spin that fast! Unfortunately, the broken gear had scored the transmission case, so the search for a rebuildable core began. I moved on to the engine, there was nothing really wrong with it, it was just time for some maintenance. New main bearings, new rod bearings, checking the rod bolts for stretch, new valve springs, typical race car stuff. I got to learn all kinds of neat tricks that really saved a lot of time, like how to replace bearings without removing the crank from the block, and how to replace valve springs without pulling the cylinder head. By the time I had the engine all buttoned up, a good transmission core had been found, and my boss who owned the shop pitched in and put the transmission together. I got everything put back into the Camaro, with new engine mounts, transmission mount, and a new torque converter. Hearing that engine fire up after all the work I had done was one of the best sounds I have ever heard. It sounded amazing, and I couldn't wait for the first race of the season.

COMING OCTOBER 2022:

LAND SPEED RACING, PART II

2022 Exhibitors



ACDC	1	G-W Publisher	18
AES Wave	11	Matco Tools	16
ATech Training	26, 27, 28	Megatech Corporation	10
Auto Student Testing	14	Mitchell1	21
CDX Learning Systems	23, 24	Motor Age	19
Cengage	25	Mustang Dynamometer	20
ConsuLab	5, 6	Pearson Education	22
DYVO	12	Rousseau Métal Inc.	13
Electude USA	7, 8, 9	TOPDON	2, 3, 4
EVPRO+ Training	17	zSpace	15

bold listings are Allied Members

PicoScope EV Diagnostic Kit



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SkillsCanada took place May 26 & 27. The secondary competition was held via a virtual format for the second year in a row. The post-secondary competition was held in person in Vancouver, BC at the Vancouver Convention Centre.



Participants from Quebec and Ontario at the engine repair station.



Post-secondary participants in the Automotive Technician Program.



Students working on the Brakes station on the right, with the Alignment station in the back left.



Ephraim Jensen.
Finished 4th in Automotive MLR.
Submitted by Drew Barnes, Vale School District (Vale, OR).



Carson Dayton.
Finished 4th in Diesel Equipment Technology.
Submitted by Drew Barnes, Vale School District (Vale, OR).



Dax Barnes.
Finished 18th in Motorcycle Service Technology.
Submitted by Drew Barnes, Vale School District (Vale, OR).



Riley Johnson.
Finished 16th in Automotive Service Technology.
Submitted by Drew Barnes, Vale School District (Vale, OR).



Christopher Blackwell.
Finished 1st in Maintenance & Light Repair (Maryland).
Submitted by Christopher Siget, North Point High School (Waldorf, MD).



Thomas Pipkin.
Finished 1st in Automotive Technology High School (Colorado).
Submitted by Tom Millard, Warren Tech (Lakewood, CO).

The National Leadership & Skills Conference
June 20-24, 2022
Atlanta, Georgia.

Congratulations!



Nicolas Marquez.
Finished 3rd in Mobile Electronics Installation.
Submitted by Ernie Cruz, Holstein Career & Tech Center (Fort Worth, TX)



HYBRID & ELECTRIC VEHICLE CORNER

CURT WARD

PROFESSOR AT JOLIET JUNIOR COLLEGE

Teaching High-Voltage Batteries

As I finish teaching the summer session of our Hybrid and Electric vehicles class, I have several observations. First, the students, who were enrolled in the class, were the most enthusiastic people I have had in class in two years. Second, these young people were passionate about electric vehicles. Lastly, the lab sessions on the high-voltage battery generated the most excitement. In this article I will highlight some of the teaching moments while working on the high-voltage batteries.

To begin the high-voltage battery lesson, we started with the low voltage controls. This included the contactors, pre-charge resistor, current sensor, temperature sensors, and the control module. It was the objective of the lesson for the students to understand that unless these components were working properly, the voltage in the battery would not be available to the rest of the system. We were able to connect a scope to the control side of the positive, negative and pre-charge contactors. We were able to prove on our 2009 Prius, the battery control module (BCM):

- First, the BCM energizes the positive contactor.
- Second, the BCM energizes the pre-charge contactor which provides a completed circuit through the pre-charge resistor.
- Third, the BCM closed the negative contactor.
- Lastly the BCM turned off the pre-charge contactor.

This allowed the high voltage to flow through the system without the possibility of an arc-flash when the circuit was completed. All the measurements were done on the low (control) side of the contactor, minimizing any risks to students and equipment. It should be noted that not all high-voltage batteries use three contactors, however, the basic principle of safely turning the system on and off is used in all the batteries we researched. We were able to view the temperature sensors and current sensor with a scan tool.

To teach the high-voltage side of the system we used our 2009 Toyota Prius. The second-generation Prius is a very student friendly vehicle and is easy find and relatively inexpensive to acquire. The concern the students were asked to research was a poor milage complaint. The initial diagnosis revealed the gasoline side of the powertrain was working as designed and the problem was likely due to the condition of the battery. There were no codes present in any of the systems.

Before removing the battery from the vehicle, the students were able to use a CATIII multimeter to prove the contactors had opened and no voltage was present. We use a measurement process that is call live-dead-live.

- *Step 1:* Measure the voltage across the 12-volt battery and confirm the meter is working properly.
- *Step 2:* Measure the voltage at the high-voltage battery connection point. (Results: Zero voltage measured. Working as designed.).
- *Step 3:* Measure the voltage across the 12-volt battery a second time to confirm meter is still working properly.

CONTINUED ON PAGE 21



Figure 1: Use of isolation meter.

While we had an open connection point at the battery, the students were able to use the isolation meter and prove there was no loss of isolation on the high-voltage system. (See **figure 1**). In reality, had there been a true loss of isolation condition, the vehicle would have not gone into the Ready mode and there would have been a code. This was just a great opportunity to practice performing the test. Once these processes were complete, the students removed the battery and place it on a wooden top work bench.

Once the cover was removed from the battery, it became very apparent the battery had a corrosion concern. (See **figure 2**). Every cell connection had extensive corrosion at the BUS bar. We believe the corrosion was because of rain water accumulating in the spare tire well as result of a bad hatch seal. The first two generations of Prius have a well-documented history of this type of concern. The connection points on the individual cells are known to leak. This did not seem to be the case on this battery. Once the BUS bars were removed and the corrosion was cleaned up, an open circuit voltage test was performed on each cell. All of the test results were

low, but within a couple of tenths of a volt of each other. The decision was made to replace the BUS bars and the retaining nuts. These parts are widely available from Toyota and from the aftermarket.

After the Bus bars were replaced and the retaining nuts were torqued to specifications, the battery was reassembled and reinstalled in the vehicle. The vehicle was powered back up and it went into the Ready mode. A scan of the data PIDs showed the battery was taking a charge, and that no codes were set as a result of the work on the battery. The vehicle was taken for a test drive and all indications point to an improved condition of the high-voltage battery.

This lesson provided a lot of great information on the operation of high-voltage batteries. More importantly, it reinforced what was previously taught in a basic electrical class. It turns out, corrosion on a high-voltage connection is just as big issue as on low-voltage circuit. The biggest take-away from this lab was the respect the students learned when it came to working on high voltage electricity. When proper tools, procedures, and safety equipment are used, high-voltage is not something that should be feared.

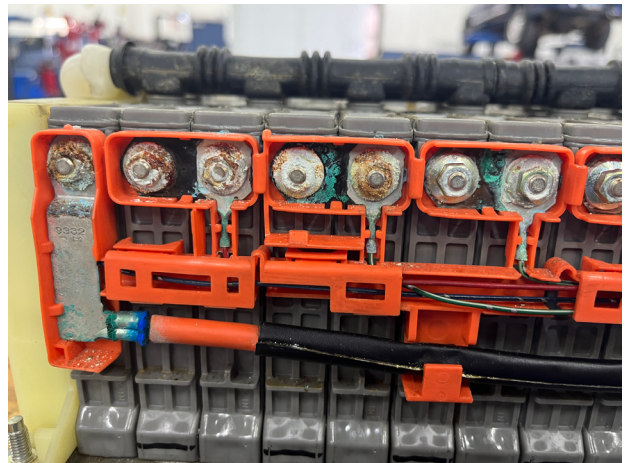


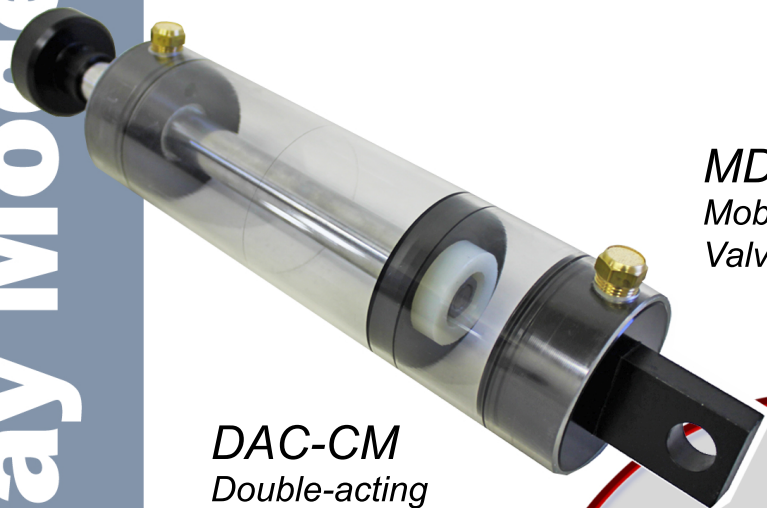
Figure 2: Corrosion

The road to success is dotted with
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Will Rogers

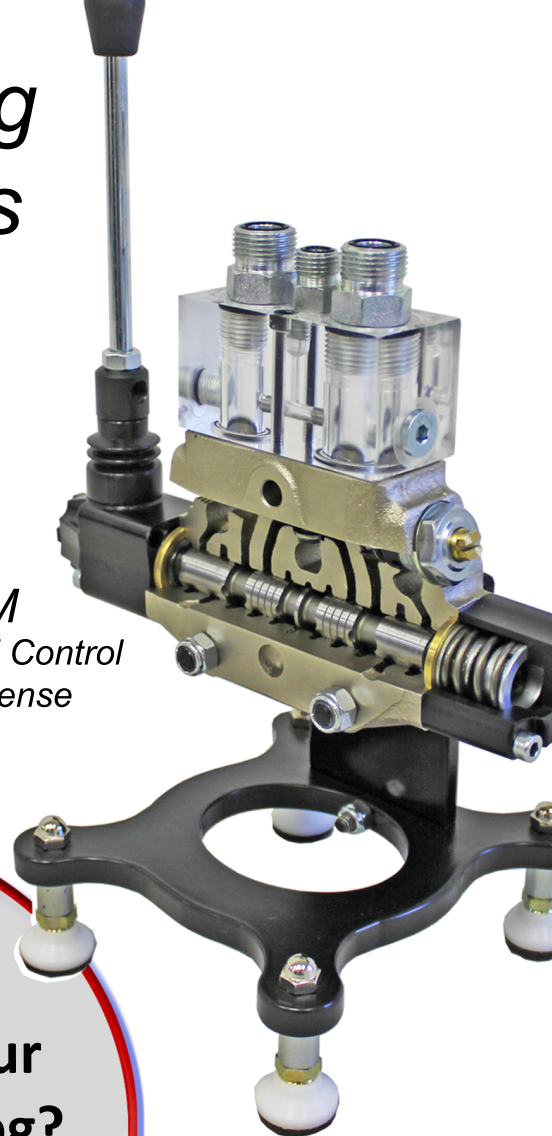
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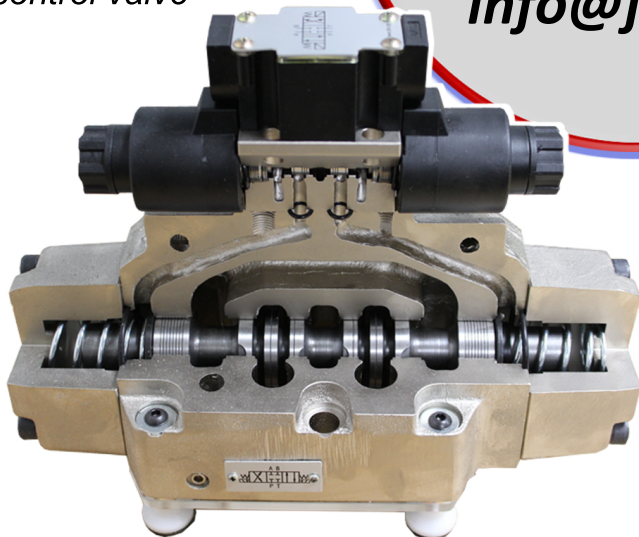


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FORD DEALERS NOW HAVE ACCESS TO REMOTE-ASSISTANCE TECHNOLOGY TO HELP GET CUSTOMERS BACK ON THE ROAD QUICKER



The two-way, hands-free electronic headset, known as See What I See (SWIS), allows for both visual and audio communication between the dealership technicians and team members at the Technical Assistance Center.

Ford dealerships across the United States now have access to state-of-the-art remote viewing technology allowing them to receive real-time assistance for customer repairs from team members at the Ford Technical Assistance Center (TAC) in Dearborn.

“The remote technology is designed to assist the technicians as they’re working on vehicles – with the goal of increasing efficiency and decreasing down time for customers,” says David Green, Ford General Service Equipment Program Specialist. “This technology modernizes and simplifies our operations, benefiting everyone involved.”

The two-way, hands-free electronic headset, known as See What I See (SWIS), allows for both visual and audio communication between the

dealership technicians and team members at the Technical Assistance Center.

The technology uses remote assistance software allows the technical assistance team to see what the dealership tech is seeing while they work on the vehicle in real time. SWIS’s augmented reality capability allows TAC team members to display modified or enhanced images on the headset for the dealer technicians to view.

According to Green, “We had one case where a technician reported the vehicle would not recognize the low tire pressure sensors. When the tech contacted the Hotline using SWIS, they quickly found out they were using the wrong tool when they tech held it up in front of the camera. Once the right tool was used, everything was programmed just the way it should.”

At the TAC headquarters, a team of about 150 technicians receives about 5,000 calls from dealership technicians across the U.S. each week looking for support or answers regarding a variety of issues. Of those, about 200 cannot be diagnosed by phone; field agents must be sent out to check out the issue in person.

“SWIS definitely helps get our customers back on the road more quickly. We’ve had some wiring situations that we were able to fix in a few hours versus a few days using See What I See and that’s really valuable,” says Susan Padro, Service Manager at Mullinax Ford in Apopka Florida.

Ford has activated 1200 of the headsets so far with more than 350 SWIS calls to TAC in the last 90 days. All US-based dealers should have SWIS in their toolbox by November of this year.

Currently, SWIS is for diagnostic assistance, but designers are working to enhance the headsets to add more specific use cases such as H-VAC concerns. Other uses cases include:

- Gaining prior approval before replacing a windshield by sending pictures of the defect instantly.
- Fleets are looking to leverage the headset to assist a technician on site with certain electric vehicle repairs instead sending an engineer allowing for faster repairs and savings on travel costs.
- Mobile service teams are also looking at using SWIS to remote in from someone’s driveway where they are performing a service like tire changes.
- Training remotely using the headset between an instructor and a student is another valuable use case to avoid having to attend a distant training center.

View the See What I See (SWIS) remote assistant headset in action by clicking [here](#).

Interested in the set-up? View the [Quick Start Guide](#) (.pdf).

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