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NACAT NEWS

VOL 38

APRIL 2024

NO.2



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NACAT News is Published SIX Times per Year!

DEADLINE DATES

June 2024 issue - May 10, 2024

August 2024 issue - July 10, 2024

October 2024 issue - September 10, 2024

December 2024 issue - November 10, 2024

February 2025 issue - January 10, 2025

April 2025 issue - March 10, 2025

The latest advertising size and rate information can be found at www.nacat.org.

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NACAT PRESIDENT'S UPDATE

DREW BARNES

VALE SCHOOL DISTRICT

Greetings Fellow NACAT Members,

Happy April 2024! Wow, how time flies! For most of us, Spring Break is in the rearview mirror and we are now looking towards the end of yet another successful school year. Before you know it, we will be enjoying the sunshine of summertime! With that being said, hopefully many of you are already making plans to register and attend the [50th Anniversary NACAT Conference 2024, in Indianapolis, IN](#). [Registration](#) for this summer's conference is [now open](#)! We (NACAT Officers, Board members, and the Business Management team) are all very excited about this summer's conference. We have an outstanding line-up of instructors/presenters [scheduled](#), with a wide variety of topics that should most definitely meet the training needs of all automotive instructors who are looking to attend. Keep an eye out for that registration email to come through your inbox!

Just a quick reminder, we have some scholarship opportunities still available! [The Jack Erjavec Innovative Instructor Award](#) is a great way to get most of your expenses covered for a trip to the 2024 NACAT Conference. This award, presented by [Cengage](#), provides a \$2,000 scholarship funding a 1-year NACAT membership and attendance to the upcoming NACAT Conference. If you are a first time attendee planning to attend this summer's conference and are planning to bring your spouse with you, please consider applying for the [Lisse Duvic Scholarship](#). This \$500 scholarship includes one guest package, two Awards Lunch tickets, and the remaining balance towards the hotel stay. The recipient will be honored at the 2024 NACAT Conference Awards Lunch. The [Mitchell1](#) Educator of the Year Award is also presented at the NACAT Conference. This award is presented to the educator that scored the highest on ASE tests during the past year.

If you are a current NACAT member and have not had a chance to browse the [NACAT website](#), please take a few minutes to do so. You will find the most up to date information for the upcoming conference as well as other useful information such as member resources, mentor roundtable information, automotive links, past issues of the NACAT News, and our membership directory. We have made some great changes to the website and are continuing to update it.

In my last President's Update, I provided an update of our current membership. I am pleased to report that we are on track to meet our goal! Please continue to follow us on social media and share posts where you feel it is appropriate to do so. Also, a reminder of the [2024 NACAT Membership Drive](#), where current members can refer a new member enrollment and be entered into a drawing for a chance to win a conference package to attend this summer's 50th Anniversary NACAT conference! The winner not only enjoys a complimentary conference package but also receives recognition at the Lunch Awards on Wednesday, July 24, 2024.

In conclusion, I would like to give a huge shout out to our [2024 sponsors](#) and [Allied members](#) for their continued support of NACAT and our goals. Without the industry support from these companies and individuals, none of this would be possible. The NACAT board, officers, business management team, and the entire membership thanks you!



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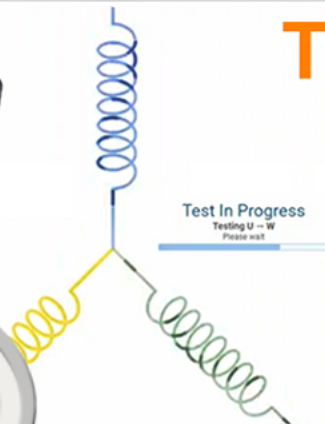


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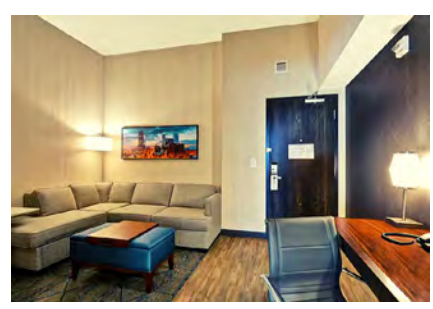
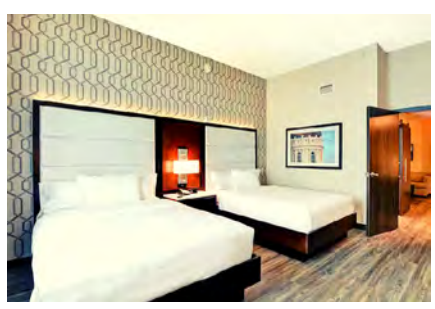
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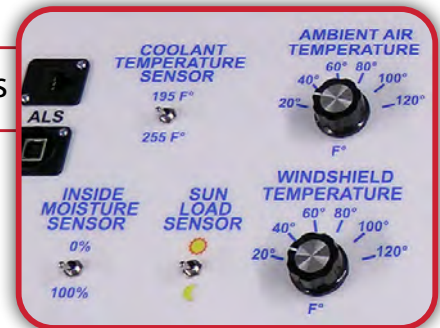
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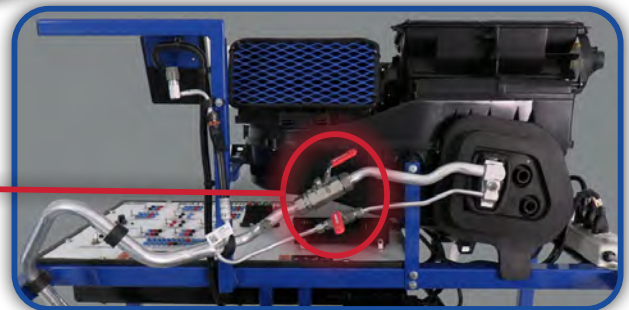
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*Thank you to those who have either joined or renewed
their membership since February 1, 2024.*

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STELLANTIS CHALLENGES HIGH SCHOOL STUDENTS TO DESIGN THEIR DREAM VEHICLE

Winning designer in 2024 Drive for Design contest to receive internship in Ram Truck design studio.

The 12th annual [Drive for Design](#) contest is underway and the Stellantis North America design team is asking high school students to create their dream vehicle for the year 2040 using inspiration from the company's North American or global brands. This year's top prize is an exclusive opportunity to intern this summer in the Ram Truck design studio.

Drive for Design is powered by the passion of Mark Trostle, vice president, Ram Truck and Mopar design, who won one of the program's early iterations as a high schooler in 1987. Since bringing back the contest in 2012, it has highlighted the path to a career in automotive design and illustrated the many creative opportunities available within the automotive industry.

"We host this contest because we want to inspire young creative talent and also enlighten parents about the many opportunities available within automotive design," said Trostle. "Many of the past winners have gone on to have successful careers here, as well as at other companies and that is what's rewarding not only to me, but our entire design team, and it drives us to continue on each year."

In addition to the summer designer internship in the Ram Truck Exterior Design Studio, the grand prize winner will also receive a Wacom MobileStudio Pro 16 tablet and have their winning sketch featured on the Stellantis North America social media platforms. Prizes for the second- and third-place finishers include an Apple iPad Pro and Apple Pencil, virtual portfolio review with members of the Stellantis design team and a scholarship to College for Creative Studies' four-week summer program. All three winners will also be invited to be a student judge at this summer's prestigious car show, EyesOn Design at Ford House, in Grosse Pointe, Michigan.

All student-created entries must be submitted by Friday, April 12, 2024.

One grand prize winner and two additional finalists will be selected from all valid entries received.

Students, teachers and parents can follow the contest on the Stellantis North America social media channels and learn about automotive design. Weekly contest updates and content will be posted every Tuesday with the hashtag #DriveForDesign.

Notable Drive for Design winners:

- 2023 winner: Rocco Morales (Northville, Michigan), First high school student intern
- 2021 winner: Vincent Piaskowski (Birmingham, Michigan), 2024 summer intern
- 2020 winner: Job Skandera (Santa Rosa, California), former intern
- 2019 winner: Max Cooper (Miami, Florida), former intern
- 2016 winner: Ben Treinen (Loveland, Ohio), Ram Truck Interior Design Studio employee
- 2015 winner: Dongwon Kim (Cupertino, California), Advanced Design Studio employee
- 2015 winner: Josh Blundo (Moultonborough, New Hampshire), former intern
- 2014 winner: Alex Fischer (Rochester, Michigan), former intern

For detailed contest rules, information on how to submit sketches and free resources for students of all ages, visit [StellantisDriveForDesign.com](#).





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2024 NACAT Conference



Agenda

Monday, July 22, 2024

9:00 am - 12:00 pm: Registration
10:30 am - 11:30 am: First-Time Attendee Meeting
12:00 pm - 2:00 pm: Opening General Session, Keynote, & Lunch
2:00 pm - 2:15 pm: Break
2:15 pm - 5:15 pm Training
4:00 pm - 4:30 pm: Break
6:00 pm - 8:00 pm: Welcome Reception at Don Schumacher Racing

Tuesday, July 23, 2024

Morning: Breakfast (included with Embassy Suites stay)
8:30 am - 11:30 am: Training
10:00 am - 10:30 am: Break
11:30 am - 2:30 pm: Lunch and Exhibits
2:30 pm - 5:30 pm: Training
4:00 pm - 4:30 pm: Break
5:30 pm - 7:15 pm: BBQ Dinner, Networking and Valve Cover Races

Wednesday, July 24, 2024

Morning: Breakfast (included with Embassy Suites stay)
8:30 am - 11:30 am: Training
10:00 am - 10:30 am: Break
11:30 am - 1:00 am: Lunch and Awards
1:00 am - 1:15 pm: Break
1:15 pm - 4:15 pm: Training
2:45 pm - 3:15 pm: Break

Thursday, July 25, 2024

Morning: Breakfast (included with Embassy Suites stay)
8:30 am - 11:30 am: Training
10:00 am - 10:30 am: Break
11:30 am - 12:30 pm: Lunch
12:30 pm - 3:30 pm: Training
2:00 pm - 2:30 pm: Break

Monday, July 22, 2024

Code	Training	Begins	Ends	Instructor
S1-1	Developing Better Diagnostic Judgement and Critical Thinking Sponsored by TOPDON	2:15pm	5:15pm	Haakan Light
S1-2	Diesel Emissions and Exhaust Aftertreatment Sponsored by ACDelco	2:15pm	5:15pm	Rob Roth
S1-3	ECU Architecture Understanding Control Process Theory Sponsored by Megatech	2:15pm	5:15pm	TBD
S1-4	Help Relay The Message! Sponsored by ATech Training	2:15pm	5:15pm	Tony Salas
S1-5	Tesla Update & Adding Tesla to Our Hybrid and Electric Vehicle Classroom Sponsored by Joliet Junior College, Pearson Education	2:15pm	5:15pm	Curt Ward
S1-6	Tips and Tricks to Best Support You and Your Students Sponsored by Promotive	2:15pm	5:15pm	Randy Klitzke, Todd Richardson, Promotive

Keynote Details

Dave Macholz will empower educators to embrace change, renew commitments to students, upskill as technicians and educators, and prepare the future workforce for today's and tomorrow's technology.

The Opening General Session and Keynote will be Monday July 22, 2024 from 12:00pm - 2:00pm (includes 1 educational hour)



Welcome Reception Details

Included in Conference Package, the Welcome Reception is open to all attendees with a real emphasis on networking. The Welcome Reception will be hosted by **DSM Precision Manufacturing** this year.

NACAT Welcome Reception: Monday, July 22, 2024 | 6:00-8:00pm



2024 NACAT Conference



Tuesday, July 23, 2024

Code	Training	Begins	Ends	Instructor
S2-1	Automotive Module Programming - Exploring all the levels of programming today Sponsored by TOPDON	8:30am	11:30am	Haakan Light
S2-2	Beyond ADAS: What you need to know going forward Sponsored by Burke Porter Group, Ascential Technologies	8:30am	11:30am	Pam Oakes
S2-3	Electrical Testing and Wiring Harness Repair Sponsored by ATRA	8:30am	11:30am	Keith Clark
S2-4	General Motors Fuel Control Advancements and Diagnosis	8:30am	11:30am	Joseph Rananese III
S2-5	Preparing for Electric Vehicle Instruction Sponsored by Electude	8:30am	11:30am	David Macholz
S2-6	Teaching Students Proper Signal Acquisition (Hands-On) Sponsored by Consulab	8:30am	11:30am	Dick Kreiger
S3-1	Circuit Diagram Analysis - A Framework for Complex Testing and Knowledge Building Sponsored by AESWave	2:30 PM	5:30 PM	Jorge Menchu
S3-2	Diagnostic Mindset Mastery for Automotive Service Technician Sponsored by Goodheart-Wilcox Publisher	2:30 PM	5:30 PM	Scott Brown, Luke Thompson
S3-3	EV Electronics (Hands-On) Sponsored by Megatech	2:30 PM	5:30 PM	TBD
S3-4	GDI, Forced Induction, and Thermal Management Sponsored by WORLDPAAC	2:30 PM	5:30 PM	Cameron Conover
S3-5	Making the Educational Leap: Electude's Connect Lineup of Trainers Sponsored by Electude	2:30 PM	5:30 PM	Dr. Alex Richards
S3-6	Refrigeration Diagnostics and Service Procedures Sponsored by ACDelco	2:30 PM	5:30 PM	Rob Roth

Wednesday, July 24, 2024

Code	Training	Begins	Ends	Instructor
S4-1	Hands-On DSG Transmission (Hands-On) Sponsored by WORLDPAAC	8:30am	4:15pm	Cameron Conover
S4-2	A Reimagined Approach to Automotive Diagnostic Training Sponsored by KG Protech	8:30am	11:30am	Georg Homolatsch
S4-3	Does (0.002) Two Thousandths Really Matter When Stopping a Vehicle? Sponsored by Pro-Cut Brake	8:30am	11:30am	Steve Smith
S4-4	Electric Vehicle Characteristics, Components, and Curriculum Sponsored by Macomb Community College	8:30am	11:30am	Nelson Kelley
S4-5	GM Diesel Engines Sponsored by ACDelco	8:30am	11:30am	Rob Roth
S4-6	Tesla Model 3 and Y in the Context of the Classroom Sponsored by Earthling Automotive	8:30am	11:30am	Jack Rosebro
S5-1	6.7L Powerstroke	1:15pm	4:15pm	Kevin Looney
S5-2	Electrical Training Simplified: Bridging the Gap Sponsored by Electude	1:15pm	4:15pm	Darcy Wedel
S5-3	EV and High Voltage Training Sponsored by Megatech, Hondo Tesla Lab	1:15pm	4:15pm	TBD
S5-4	Teaching ADAS (Hands-On) Sponsored by Consulab	1:15pm	4:15pm	Al Santini
S5-5	Understanding Today's New Relay Technology Sponsored by Consulab	1:15pm	4:15pm	Dick Kreiger

2024 NACAT Conference



Thursday, July 25, 2024

Code	Training	Begins	Ends	Instructor
S6-1	Advances in Modern Performance Tuning Sponsored by The Tuning School	8:30am	11:30am	Robert Morreale
S6-2	Communication Bus Diagnostics with Pico Scope Sponsored by WOLRD PAC	8:30am	11:30am	Cameron Conover
S6-3	Diesel Aftertreatment & Emissions	8:30am	11:30am	Kevin Looney
S6-4	Teaching ADAS Technologies to Pass the ASE L4 Test Through Hands-On Experiments Sponsored by Lucas-Nuelle	8:30am	11:30am	Dirk Niemeyer
S6-5	Teaching Electricity So Students Understand Sponsored by CDX	8:30am	11:30am	Keith Santini
S6-6	Teaching EV High Voltage in the Classroom (Hands-On) Sponsored by Consulab	8:30am	11:30am	Al Santini
S7-1	Advances in Automotive Technology Sponsored by Lincoln Tech	12:30 PM	3:30 PM	Doug Garriott
S7-2	EV Plug-In-Power Tips Sponsored by Delphi	12:30 PM	3:30 PM	Dave Hobbs
S7-3	Teaching the Essentials of Electric Vehicle Technology Sponsored by AutoEDU	12:30 PM	3:30 PM	Paulius Mascerinskas
S7-4	The Level 2 ASE (xEV) Safety Exam and Program Changes Sponsored by Joliet Junior College, Pearson Education	12:30 PM	3:30 PM	Curt Ward
S7-5	TPMS	12:30 PM	3:30 PM	Sean Lannoo
S7-6	Visual Tools for Advanced Driver Assistance Systems (ADAS) Instruction Sponsored by AESWave	12:30 PM	3:30 PM	Scott Brown

Pricing Details

	Before May 15, 2024	After May 15, 2024
NACAT Members	\$550	\$625
Non-Members	\$650	\$725

TRAINING COURSE SELECTION: Selections must be made in advance and are available on a first-come, first-served basis.

MEALS: Breakfast is included with an Embassy Suites reservation. Lunch is served Monday, Tuesday, Wednesday, and Thursday. Refreshment breaks are each day.

NACAT Member Discounts: NACAT Members receive a \$100 discount on registration packages. Visit nacat.org to become a member or click the add-on option during your registration.

Hotel

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Cost: \$169 per night plus tax

REGISTRATION & PAYMENT: To register, please complete the online registration form at www.nacat.org. Registrations must be received no later than July 15, 2024. Registrations accepted ON-SITE ONLY after July 15, 2024. We cannot guarantee availability for late or on-site registrants. A confirmation letter and detailed conference information will be e-mailed in early-July.

CANCELLATION AND REFUND POLICY: Full refunds will be granted, less a \$30 processing fee, if cancellation is received in writing by June 15, 2024. No refunds will be granted after June 15, 2024. Name substitutions will be accepted.

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Exploring a Tesla Inductive Drive Motor

As I write this article, warm weather has arrived in Chicagoland, and the spring semester is fast coming to a close. Recently, our program had the opportunity to acquire a used rear drive motor assembly from a 2015 Tesla Model S. The main reason for adding this drive motor to the class is that it is an induction style motor. This drive motor contrasts with other permanent magnet style drive motors we already have in our program. The unit has been disassembled and a power flow demonstrator has been created. In this article we will share some of what we learned during the disassembly.

The drive motor is from a standard range, rear wheel drive Model S (**See Figure 1 - drive motor assembly**). The drive unit contains the drive motor and the inverter. DC voltage is delivered from the battery, and the inverter changes the DC



Figure 1: Drive Motor Assembly



Figure 2: Oil Pump Assembly

volts to AC volts to operate the drive motor. The mechanical portion of the drive unit is lubricated with automatic transmission fluid and coolant is circulated throughout the unit to remove the heat from the inverter, the electric motor and the transmission fluid used to lubricate the mechanical components. The oil pump is a mechanical unit driven by the ring gear (**See Figure 2 – oil pump assembly**). Anytime the wheels are turning, lubrication is provided for the mechanical portion of the drive unit. We discovered during the disassembly process that a failed coolant passage seal allowed coolant to fill the normally dry electric motor cavity, likely causing a loss of isolation

failure, and caused damage to the front armature support bearing (**See Figure 3 – failed seal**). Later, we learned this is a relatively common failure in this generation of drive motor assemblies.

The induction style drive motor uses a copper core armature instead of permanent magnets. It is a 3-phase, 4-pole design. The connector bars appear to go straight through the armature instead of being a twisted design. On the front end of the armature is a speed sensor reluctor wheel. The armature is monitored by a dual hall effect sensor for speed only. An induction style motor does not require monitoring for position or direction of rotation like a permanent magnet style armature and therefore does not require the use of a resolver. The armature is supported by two sealed bearings that have non-conductive balls made of silicon nitride. This design improves the bearings durability and gives it an insulating property.



Figure 3: Failed Seal

CONTINUED ON PAGE 19

The power flow demonstrator is relatively simple in design (See **Figure 4 – power flow demonstrator**). The electric motor output gear drives an intermediate gear. The intermediate gear also serves as the pinion gear and turns the differential that provides the power to the drive wheels via the half-shafts. It takes just under 9.75 turns of the electric motor to turn the differential once. Our students will be able to use the power flow demonstrator to identify the components, describe the power flow, and calculate the gear reduction.



Figure 4: Power Flow Demonstrator

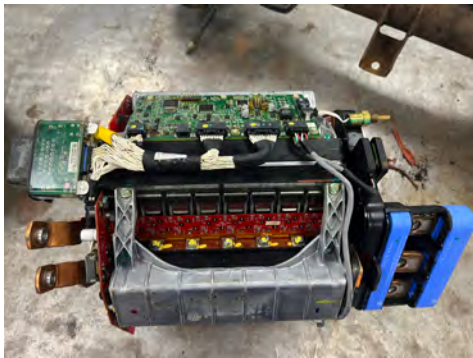


Figure 5: Inverter

The inverter contains the low voltage control circuits as well as the transistors (IGBTs) to control the voltage and current needed to operate the drive motor (See **Figure 5 – Inverter**).

After searching the Tesla online parts catalog, we determined that Tesla is not servicing any of the internal components in this unit. It appears that any internal failure, mechanical or electrical, will result in a unit replacement. An Internet search revealed that some aftermarket service facilities are replacing the failed seal and bearing discussed earlier in the article.

Would you like to know more? Look out for my presentation at this summer's NACAT conference titled: **Tesla Update & Adding Tesla to our Hybrid and Electric Vehicle Classroom**. In this class will explore many Tesla related topics, including the induction style drive motor assembly.

I will finish this article with the same offer I make after each of my presentations. If you are interested in getting started in the process of adding hybrid and electric vehicles to your curriculum or want more information, please feel free to [reach out](#). I am more than willing to sit down in-person or online and share my experiences. Are you looking for a classroom textbook? [Reach out to Pearson](#) and ask for a review copy of the all-new [Electric and Hybrid Electric Vehicle](#) text that Jim Halderman and I co-authored. It is a comprehensive text covering all the latest information on the subject.

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C.S. Lewis

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- No engines or propulsion.
- No moving weights.
- Wheel can be attached to the car in any manner, but must not extend beyond the front of the valve cover.
- Nothing may extend beyond the front of the valve cover.
- Wheel must have a non-metallic surface contacting the track.

Critical Dimensions:

- 30 inch (30" or 76.2 cm) maximum overall car length.
- 15 inch (15" or 38.1 cm) maximum overall car width.
- 10 inch (10" or 25.4 cm) maximum overall car height.
- 10 pounds (10 lb or 4.5 kg) maximum weight by official scales.





TIPS & TRICKS

JEFF BOGUE

SERVICE TECHNICIAN AT ATECH TRAINING

Engines of the Future are Already Here!

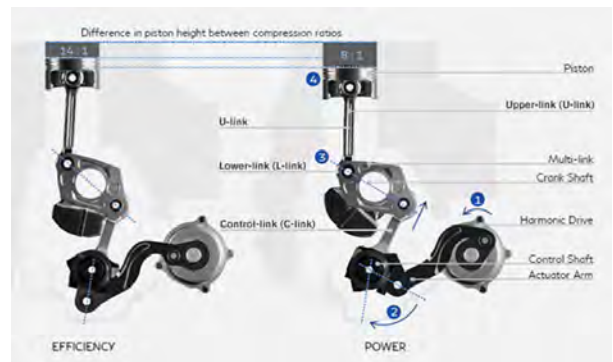
I have been dreaming about and studying engines and engine performance of cars, trucks, and motorcycles for the better part of 45 years. It's a hobby. It keeps me busy on cold winter evenings. It's something that has become a large part of my life and, like playing with dogs, is something I love to do. I have written about engines and the engineering that is involved in them for the last 15 years, and I have always been forward-thinking. When a new engine is being lauded by the manufacturers as the next big thing, I read all about it and report those findings here. In the past, I have written about every one of the engines in this article at one time or another, and each one was glowingly revealed by the engineers with the statement "We can expect these engines in our cars in the next few years". Well, a few years have passed and now most of these engines ARE in our cars and trucks and should be reaching repair shops and dealerships now. We just haven't heard that much about them because people, as a general rule, really don't care that much about which engine is in their car if it gets good gas mileage, is reasonably reliable, and has a little umph to get on the highway. Well, that is not us. We care. We study it. It's what we do and why you are where you are reading this article. Without further ado, let us look at the "Engines of the Future" that you can buy (and service) now.



Number one is the Mazda SkyActive-D. The name SkyActive has been around for a while, but the D designation is still new. This is a great little engine. It is appearing in the CX-5 and the Mazda 3 and 6. It's a 2.2-liter turbo diesel with a lot of engineering chops, and it has the lowest compression ratio of any diesel on the market (14.1:1) while still generating a solid 173hp and 310 lb-ft of torque. This lower compression ratio lowered the temperatures in the piston at the top-dead-center which resulted in lower NoX and soot and a better mixture of air and fuel. The lower compression ratio also lowered the friction ratios and allowed lowering the structural weight of the engine. This increased but did not come without its drawbacks. During a cold start, the fuel-to-air mixture was

not optimal and would cause misfires. To battle this, the engineers introduced a new ceramic glow plug that gets crazy hot crazy fast and a variable exhaust lift to help facilitate warm-up and provide efficient cold-temperature operation.

The next on the list is the SkyActive-X. I don't know if this should be number 2 or 1.5 as it hasn't been released in the US just yet but has been in the European market for a few years. This engine is a gasoline-burning compression ignition. The sheer amount of engineering that goes into Spark Controlled Compression Ignition is astounding. This technology is reported to increase torque by about 20% and fuel efficiency between 20% and 30%. This allows a European Mazda 3 to get around 50 miles per gallon. As I see it, it isn't in the US market because it isn't as powerful or cheap as other offerings from other manufacturers. That being said, Mazda is toying with the idea of releasing a larger engine version in the US.



CONTINUED ON PAGE 25

Nissan has a new engine that really raised some eyebrows when it was in development. It is their new VC Turbo with the VC standing for variable compression. The VC Turbo utilizes an advanced multi-link system that can adjust the position of the top dead center of the piston on demand. As the piston's position changes, so does the compression ratio. A high compression ratio gives greater efficiency, and a lower compression ratio boosts power and torque. They have introduced the new engine in two different sizes depending on the vehicle with the 1.5-liter going into the new Rogue as an option and the 2-liter going into the Altima. Each delivers 200 and 250 HP respectively. The engine is a true engineering feat, but performance and fuel efficiency gains are only between 10% and 20%. These are all baby steps for something in the future but still result in gains that will help meet their economic goals with engineering looking to the future with this engine.

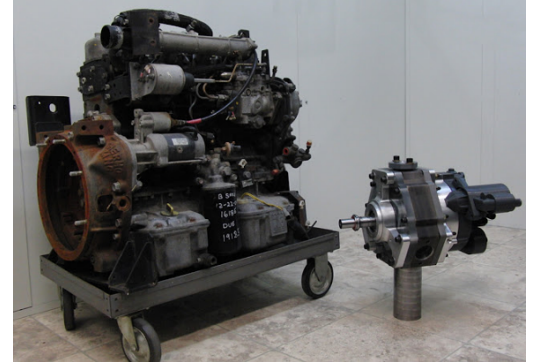


Not to be outdone, Toyota introduced its Dynamic Force engine back in 2018. There are currently three basic engines in the lineup with I3s, I4s, and V6s ranging from 1.5 liter to 3.5 with a total of 17 different iterations. The design marvel of these is the fact that with a suite of small improvements, they ended up with an engine with a thermal efficiency of 40%. Older-style engines usually run at 30% or less, which means that 70% of combustion gets lost as heat. Toyota accomplished this by including a longer stroke, higher compression ratios, multi-hole fuel injectors, intelligent variable valve timing, and direct injection. That's a lot of little stuff. The result: Used on the 2018 Camry, fuel economy is 29-mpg city and 41-mpg

highway, a 26% improvement over the previous model year. The Dynamic Force series has slowly grown to 17 engines that will replace most other variants in the coming years (which was reported to be around 800 in 2019). The newest model to come out of engineering is a 2.4-liter turbocharged version of Lexus that was introduced in 2022.

GM and Ford have updated their lineups, along with everyone else, with the introduction of the GM HO 2.7 and the Ford Eco boost series. Both of these engines offer fairly good results with cylinder deactivation and either variable valve lift or variable valve timing. As these engines are being used in large trucks, some people are not as impressed with performance or reliability as the two American manufacturers had hoped to accomplish.

This next engine isn't an automotive power plant, but it is still a bit amazing. It is the rotary engine from Liquid Piston. It is a rotary, but it isn't a Wankel. It is designed to be stackable and carries about 2HP per pound. It can run off almost any fuel that you can feed it and has proven to be extremely efficient. After receiving a DARPA contract a few years ago its development has been steered towards usage as a military power generator and an engine for military drones. What really sets this engine apart (other than being a Rotary) is the fact that it utilizes a High-Efficiency Hybrid Cycle. Liquid Piston describes this as "a completely new 4-stroke thermodynamic cycle that combines elements of the Otto Combustion Cycle, the Diesel High. Compression Ratio Cycle, the Atkinson Over Expansion Cycle, and the Rankine Internal Cooling with Air or Water Cycle. When you combine all these elements into a single entity, the engine almost seems magical. That being said, most won't see this engine anytime soon unless you enlist in the military.



The last engine on the list is one that I had discussed about 5 years ago when it was still on the drawing board. It has finally made it into a vehicle. That true result of wizardry is the Koenigsegg camless engine called FreeValve. This little dynamo uses "pneumatic-hydraulic-electronic" actuators to displace the cam. This results in a precisely managed combustion in each of the cylinders independently thus eliminating the



throttle body, cam drive, timing gear, wastegate, pre-catalytic converter, and direct injection system. The first result is an engine that produces extremely low emissions. The end result is a twin-turbo 2-liter 3-cylinder that not only weighs a mere 150 pounds but produces just shy of 600 horsepower. That combines with the three electric motors to produce a whopping 1700 hp. The Gemera will be coming off the assembly line in late 2023 with a price tag of 1.1 million dollars with only 300

being manufactured. Of course, they are all already spoken for, so I guess I will have to spend my money elsewhere.

This is all fascinating as it shows that the internal combustion engine is not dying but thriving. Of course, we are shifting to electrification slowly, but cars and trucks are still a long way from scorning the cylinder-driven engine.

I am not a teacher, but an awakener.

– Robert Frost

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ELECTUDE NORTH AMERICA IS PLEASED TO ANNOUNCE ITS PARTNERSHIP WITH ADVANCED VEHICLE TECHNOLOGY GROUP (AVTG)

Led by [Dave Macholz](#), AVTG is joining forces with Electude to provide training for Electude's new Connect line of training aids. In addition, AVTG will offer train-the-trainer for educators planning on adding or expanding their instruction regarding hybrid and electric vehicles.

Darrell Christopher, Electude Director of Sales, North America, said, "Instructors have to justify their spending and return-on-investment for purchase of things like training aids. We believe just making and selling these devices is simply not enough, and that many customers will benefit from online or in-person training solutions designed to ensure they get the most from the devices and e-learning we provide."

Dave Macholz, founder and CEO of AVTG said, "Electude already sets itself apart from other providers of training aids by integrating courseware with every device that teaches the student how to use the device and provides hands-on activities for using the device, which are also tracked and auto-graded to save the teacher time. My team at AVTG will work with schools adopting these products and ensure that they are set up, working properly and that teachers have strategies in-place for their use as part of their automotive curriculum before they start teaching with them."

Macholz also said, "It is apparent that electric and hybrid vehicle is a 'hot topic' in automotive education. It is also a fact that many educators do not feel ready to teach the topic due to lack of their own hands-on experience, lack of proper equipment and vehicles for their shops and uncertainty about curriculum and learning materials. We at AVTG, especially via our partnership with Electude, will work hard to address these topics, including strategies for gaining access to funding to purchase what is needed to create a great student experience."

About Electude: Electude has been a global innovation leader in automotive technology education for over 30 years. Electude is in use today globally by over 900,000 students and over 50,000 instructors in 70 nations, translated into 35 languages. Using an integrative, highly interactive gamified learning method, Electude has revolutionized the automotive education industry by empowering vocational students to learn effectively and give instructors custom time-saving tools. Electude North America provides a localized version of Electude to customers in the United States, Canada and the Caribbean. Visit www.electude.com for more information.

About AVTG: AVTG was founded to address the emerging national skills gap presented by the advancements in vehicle technology. AVTG provides training, consulting, and services for the advanced transportation workforce which includes training opportunities for educators, technicians, first responders and related service personnel. Visit www.avtg.org for more information.

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PENN COLLEGE RECEIVES NEARLY \$1.5 MILLION NSF GRANT TO AID TRANSPORTATION WORKFORCE

Pennsylvania College of Technology is the recipient of a nearly \$1.5 million federal grant to support students majoring in a transportation-related field.

The National Science Foundation awarded \$1,498,465 as part of its S-STEM program, which funds scholarships for academically talented low-income students.

Dubbed [Transportation Scholars](#), the program will provide up to \$10,000 annually for eligible students. To meet the criteria of high achieving and low income, students must have a high school GPA of at least 3.0 and be eligible for Pell Grant aid.

Scholarship recipients are required to be seeking an associate degree in [aviation](#), [automotive](#), [collision repair](#), or [diesel](#).

"In a nutshell, jobs in these transportation fields are plentiful and command high salaries," said Bradley M. Webb, dean of engineering technologies. "We are grateful to the NSF for recognizing Penn College's long history of success in preparing students for careers in the transportation industry. With the support of this grant, we hope to offer such opportunities to students who might otherwise not have the means to pursue such enriching careers."

Automotive technicians inspect, maintain, diagnose and repair complex systems on vehicles. Aviation maintenance technicians repair and maintain everything from gliders to helicopters to jets. Collision repair technicians repair damaged vehicles to their pre-accident condition. And diesel technicians fix and maintain diesel-powered highway, industrial, and marine vehicles and equipment.

"All of these fields require proficiency in math," Webb noted. "That's why mathematics and transportation faculty at the college are working together to contextualize math concepts using practical examples from the transportation industry. Linking mathematics to careers that are of interest to students can be an effective way to improve learning."

The Transportation Scholars will be part of a cohort that will meet monthly through the college's Career Seminars program, featuring personal development activities and field trips to local employers. Individually, the students will be assigned a faculty adviser who will serve as a mentor and career coach.

"We're confident the various components of the Transportation Scholars program will have the cumulative effect of increasing and diversifying the students eyeing a career in transportation. Eventually, that will pay dividends for the industry as a whole," Webb said.

The grant's principal investigator is Robert K. Vlachich, associate professor of automotive technology and department head. Co-principal investigators are Webb and Brad R. Conklin, faculty in diesel equipment technology.

This material is based upon work supported by the National Science Foundation under [Grant No. 2221107](#). 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.



More than 200 NACAT members gathered for the opening meeting at the 2018 NACAT Conference.



Pennsylvania College of Technology was the host for the 1998, 2008, and 2018 NACAT Conferences.

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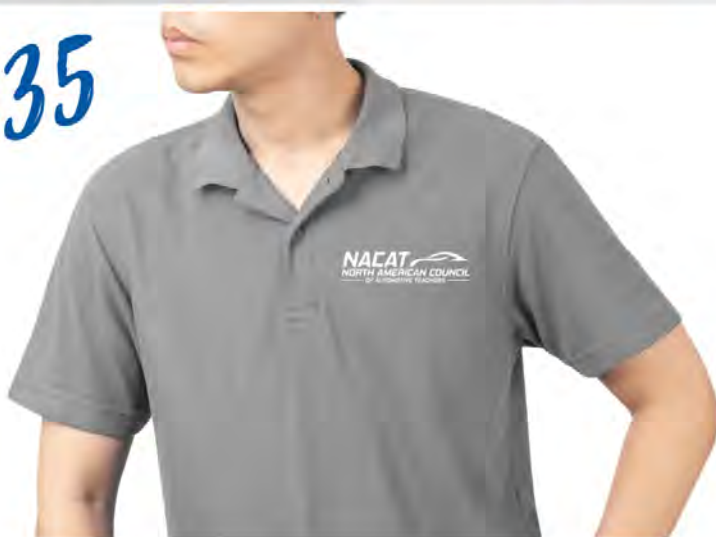
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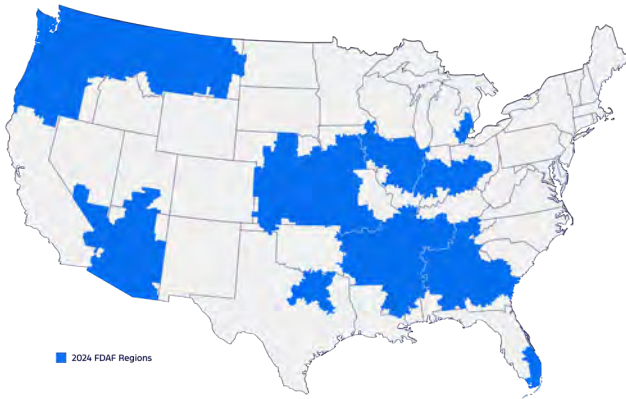
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all wearables will be delivered at NACAT Conference

FORD DEALERS AND FORD FUND INVEST \$2 MILLION TO TRAIN FUTURE AUTO TECHS



Application regions include over 20 states and 292 eligible schools. A list of eligible schools can be found [here](#).

Ford dealers and Ford Fund, the philanthropic arm of Ford Motor Company, are investing \$2 million in scholarship funding in 10 regions to help students pursue careers as automotive technicians. Spanning over 20 states and 292 eligible schools, the Ford Auto Tech Scholarship will grant 400 need-based awards to current or future students enrolled in post-secondary auto programs.

The automotive industry continues to face an ongoing shortage of technicians, with over 400,000 techs needed by 2027. Now in its second year, the Ford Auto Tech Scholarship creates opportunities for rewarding, well-paying careers as the industry moves toward electrification and software integration.

“As vehicles become more advanced, we need highly skilled technicians to maintain and service them,” said Elena Ford, Chief Dealer Engagement Officer at Ford. “Partnering with our dealers to invest in these students helps create job opportunities, shapes the future of our communities, and drives growth in our industry.”

The Ford Auto Tech Scholarship is open to individuals pursuing automotive technology degrees or certificates in the 10 selected regions, covering various costs associated with their education. The scholarship may be used for all attendance costs, including tuition, tools, living expenses and transportation. During the students' educational journey and career transition, Ford dealers in each region will serve as a support system, offering advice, onsite training, and career guidance.

“Every technician plays a vital role in moving our communities forward. In order to solve the shortage of technicians the transportation industry currently faces, and because diversity drives innovation, we need to make the field more accessible for people of all backgrounds,” said Jennifer Maher, Chief Executive Officer of TechForce Foundation. “By partnering with Ford dealers and Ford Fund to remove barriers to entry and increase greater economic mobility, we pave the way for more communities to thrive.”

The Ford Auto Tech scholarships will be administered by TechForce Foundation, a national nonprofit organization committed to supporting students pursuing technical education and careers as professional technicians. Ford is proud to partner with TechForce to grant \$5,000 per student in financial assistance for education and training in auto and auto/diesel at a wide range of accredited institutions.

For Makenna Enga, a student recipient from UTI-Phoenix, this scholarship means breaking free from traditional career paths.

“I am extremely passionate about pursuing a technical education in automotive technology for many reasons,” Enga said. “To start with, a pretty obvious one is the lack of women in the industry. No one in my family has studied a trade, but I believe I was made for it.”

Last year’s contribution directly resulted in 200 students receiving \$1 million in scholarships across four regions: Greater Atlanta, Chicago, Dallas and Phoenix.

Students eligible for the 2024 Ford Auto Tech Scholarship must be pursuing a degree in one of the following regions: the Greater Atlanta, Chicago, Dallas, Detroit, Phoenix, Kansas City, Memphis, Miami, Seattle, and Cincinnati areas. **The application process is open from March 4 through Aug. 31, 2024.** Scholarships will be awarded on a rolling basis and applications reviewed as received. To learn more about the 2024 Ford Auto Tech Scholarship, or to apply, please [visit the TechForce website](#).

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North American Council of Automotive Teachers (NACAT), hosted this Educator Reception along with the amazing sponsors (AES Wave, Consulab, Electude, and EVPro+) last February 29, 2024 during VISION in Kansas City. This is a platform for industry educators to network, learn, and celebrate the essence of being educators in the automotive service industry.



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