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Automotive Education plans power through at Eleva-Strum



The Technical Education program at Eleva-Strum High has moved forward with its plans to purchase and install an automotive lift on the shop floor. The lift was recently installed and is now functional.

Tech Ed teacher Craig Cegielski said that acquiring a lift had been in the works for several months leading up to the purchase. When the opportunity arose, Cegielski took advantage of business connections to bring in a quality piece of equipment at a very low price.

The lift itself came all the way from Hurley High School, located within miles of the Wisconsin/Upper-Peninsula Michigan border. "Hurley is building a student-run business like Cardinal Manufacturing," Cegielski stated. He actually received word of the lift after a former student teacher was hired at Hurley. The northern High school simply didn't have

enough room for a lift, and so it went on the market. Only two years old, the lift came to Eleva-Strum for a price well below original estimations.

Now that the lift is at Eleva-Strum, Cegielski is focusing on building up the automotive class to accompany it. "The program is not intended to make students into automotive mechanics," Cegielski explained early on. His plan is to create a class that teaches students about, "being an informed consumer."

"Coming into this class, we want to go under the assumption that everyone is going to own a car in life," Cegielski stated. "They're very expensive; other than a home, it's probably one of the largest investments you're going to make. You should know something about it."

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Port Washington Police Department Using Propane Fueled Squad Cars

*From Michael Keller, Captain
Port Washington Police Department*

The Port Washington Police Department currently operates a fleet of 7 patrol vehicles as well as a number of other department vehicles. Generally, at least three patrol vehicles are on the street around the clock, 365 days a year. Two years ago our annual fuel budget was in excess of \$60,000. In an effort to reduce fuel expenses Capt. Mike Keller began researching potential alternative fuel systems for use with the patrol fleet.

Following nearly a year of research the City approved the plans and necessary funding, including the purchase and installation of a propane autogas dispensing station from which to fuel the squad car. The department launched the alternative fuel project with the purchase and installation of a bi-fuel propane conversion system into a newly purchased 2014 Ford Police Interceptor Utility squad car. The squad was deployed into full-time service in late December, 2013.

Since December the squad has been in use on a daily basis. It runs and performs

no differently than when fueled with gasoline. Since it is a bi-fuel conversion, we can simply switch back to gasoline operation at the touch of a button, should that be necessary. Data collected reflects a current average savings of approximately \$500 per month when compared to the consumption of a similar amount of gasoline. Two additional new replacement squads were purchased and converted earlier this year. These squads are scheduled to be placed into operation in the coming weeks. The department will continue to convert new replacement squad cars as older conventional squads are retired. The switch to an alternative fuel system is truly a "green" effort, saving taxpayer dollars, while reducing vehicle emissions for a cleaner environment.

Propane Fuel Basics

Also known as liquefied petroleum gas (LPG) or autogas, propane is a clean-burning, high-energy alternative fuel that's been used for decades to power light-, medium- and heavy-duty propane vehicles.



Propane is a three-carbon alkane gas (C₃H₈). It is stored under pressure inside a tank and is a colorless, odorless liquid. As pressure is released, the liquid propane vaporizes and turns into gas that is used for combustion. An odorant, ethyl mercaptan, is added for leak detection.

Propane has a high octane rating and excellent properties for spark-ignited internal combustion engines. It is non-toxic and presents no threat to soil, surface water, or groundwater. Propane is produced as a by-

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PUBLISHER/EDITOR: Renee Feight
PUBLISHER/EDITOR: Larry Werner
EDITORIAL: Andria Reinke
PAGE COMPOSITION: Andrew Clausen
WEBMASTER: Scott Bayerl
Please direct articles, advertising, questions or comments to:
Transportation Today WI™
PO Box 1704
Eau Claire, WI 54702
Phone/Fax 715-839-7074
www.transportationtodaywi.com

Please direct all inquiries to:
renee@transportationtodaywi.com, or
larry@transportationtodaywi.com

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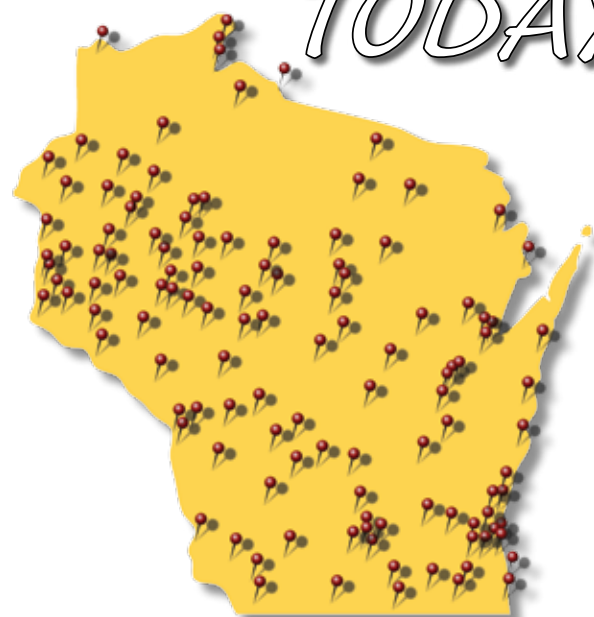
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8th Grade Prototype Bridge Competition Holds 208 Pounds

Amery School District's Technology Education department is embracing Engineering and STEM (Science, Technology, Engineering and Mathematics) curriculum. Mr. Koehler's eighth grade students are studying an Engineering activity showing them how to design and build a wood bridge prototype to hold 208 pounds with the most efficiency.

The engineering process is followed to demonstrate principles of engineering and help the student succeed in designing a strong bridge. Students enjoy testing the bridges on Mr. Koehler's tester because they compete to see who has the most efficient bridge in class.

The testing is done in front of the whole class and the students present their design with their peer's assistance by giving feedback on each design. This effective use of teamwork is a skill practiced in this activity and an example of what is used in business today. The testing is high energy and a little stressful, just like the world of engineering.

The tester uses free weights stacked in a carrier that hangs from the top edge of the wood bridges. The tester and this activity were designed

by Mr. Dale Koehler and Mr. Dan Raether two Amery Technology Education Teachers several years ago. The tester is purposely designed to allow student to make decisions about how to load and how much to load upon their bridge truss. The student has control over the test procedure but the testing device helps keep the results measurable. Thorough problem solving is used in this activity.

The students begin with a well thought out problem statement and they are required to research related information. There are parameters and limitations set for the students. The sketching of ideas in a design notebook, and a final technical drawing lead the students into the building process. Once the building of the models begins, the class focus switches to learning different processes of construction.

Finally, the testing begins. Students are trying to have their design hold 208.7 lbs. of free weights. If their idea does hold, their bridge is displayed on the "Wall of Fame" in Mr. Koehler's classroom until they graduate from high school. "One of the things I like about the wall of fame is that it fosters competition among students and



highly motivates students when they see friends or even siblings on the wall" explained Mr. Koehler. This bridge activity is the beginning of a series of courses students can take related to engineering. The High School Tech Ed Department offers a Discovering Technology course

where student learn more about Engineering and a Principles of Engineering class which allows students to apply math and science skills.

www.amerysd.k12.wi.us

Student Transportation Video Contest

Congratulations to our 2013 Video Contest Winners!



Category One winner: "By the Numbers: Bridges in the United States" — Christian Surtz, Marmion Academy, Batavia, Illinois



Category Two winner: "Importance of Infrastructure" — Tom Rogers, University of Maryland, South Boston, Virginia



2014 Video Contest Open Now!

The American Road and Transportation Builders Association (ARTBA) would like to know what you think. The 2014 Transportation Video Contest has just opened, and students of all ages are encouraged to apply!

The top two student videos (one winner in each category), as selected by ARTBA, will each be awarded a \$500 cash prize. The winners, along with other submitted videos, may be shown at the ARTBA National Convention. Entrants may work in teams, but only ONE prize is awarded per video. Submitted videos may also be featured on the ARTBA website, screened on YouTube, and/or other promotional venues.

Entrants should create an original two (2) to four (4) minute video examining any aspect of transportation in the United States. Some suggested topics include:

- U.S. Transportation Infrastructure 101
- How infrastructure is built and paid for
- What are the costs and financing needs of transportation infrastructure
- What are the impacts of congestion and changing travel demands
- What are the "man on the street" impressions of the industry versus reality
- Recent transportation and urban design/development patterns

ARTBA is looking for creativity, so stretch the bounds of your imagination! Entrants must submit a video in one of two categories based on their school attendance through August of 2014:

Category One: Entrants are in elementary, middle or high school. This includes high school students who graduated in 2013 but may be planning to continue their studies at a post-secondary institution. Teachers/directors of elementary, middle, or high school students are eligible to participate with their class/program; however, the video must primarily be the work of the students.

Category Two: Entrants are currently enrolled in a post-secondary, college or graduate school program.

Entries will be judged on creativity, technical merit, adherence to contest requirements, and on how well they manage to convey the themes of the topic. These are clearly subjective categories and will be treated as such. The final awards will be selected based solely on the judges' consensus.

Direct any questions to Lital Shair at lshair@artba.org. More details about this contest can be found at the website below.

Deadline: Video Submission Deadline: August 1, 2014

Website: www.artba.org/video-contest

View the 2013 Contest Winners at:

www.artba.org/2013-video-contest-winners



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Rawson Avenue Bridge Replacement

A recent use of SPMTs (Self-Propelled Modular Transporters) took place in June 2013 when the Wisconsin Department of Transportation (WisDOT) reconstructed its Rawson Avenue Bridge along Interstate 94 in Oak Creek, just south of Milwaukee. The new \$4.2 million bridge was built in two staging areas on either side of the highway and then moved into place using SPMTs. The entire move required only a 12-hour highway closure, with each move itself requiring an estimated two hours.

The 188-ft-long bridge features two spans (98 ft 6 in. and 86 ft 6 in.) consisting of WisDOT wide-flange, prestressed concrete girders. With a width of 138 ft 2 in., the bridge has fourteen 45-in.-deep girders per span spaced at 10 ft 1 in. The intermediate support consists of multicolumn precast concrete piers with precast column caps, supported by spread footings. The spans weighed approximately 1545 and 1345 tons, including the 10-in.-thick deck, parapets, and sidewalks.



The DOT set up an area on the east side of I-94 where reporters and any interested onlookers could watch the move. A large group of people watched the project shortly after the freeway was closed on that evening and many stayed during the overnight hours.



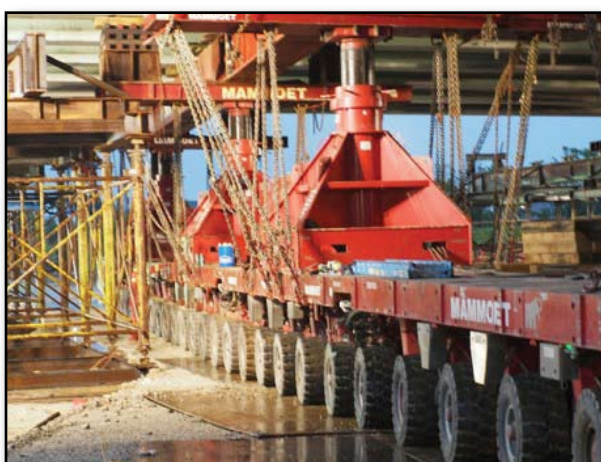
Construction was accelerated by constructing the bridge elements concurrently rather than sequentially. Bridge superstructures were constructed on temporary shoring towers in staging areas in the quadrants of the interchange. This work was accomplished while the existing bridges remained in service. Further, full-height MSE abutment walls were designed to be constructed below the existing bridges while they remained in service. SPMTs (Self-Propelled Modular Transporters) also allowed the spans to be built concurrently with the substructures. More conventional techniques were also used on the project, including stage construction and high early strength concrete.



The project became Wisconsin's first use of SPMTs (Self-Propelled Modular Transporters) to rapidly construct a bridge, which reduced travel costs for motorists using the bridge and increased safety for the public and construction workers. Not only that, the Rawson bridge became Wisconsin's first bridge to incorporate a precast concrete multiple-column pier and the first time in Wisconsin history that a new bridge was open to traffic in just three weeks.



SPMT bridge construction uses multi-axle platforms that move at walking speed and are capable of carrying bridge superstructures from construction sites located within the quadrants of the interchange. The bridge structures are constructed off-site and then moved to the construction site where they are positioned precisely into their final arrangement at the bridge site. SPMTs then exit the site, returning the roadway under the bridge to traffic within hours. I-94 was closed for only 12 hours during the Rawson Avenue Bridge move.



Each span was moved using two lines of SPMTs, with each line consisting of six SPMTs connected end-to-end. Each SPMT had six axles with four wheels per axle, providing 24 wheels per SPMT, 144 wheels per line, and 288 wheels for both lines. Each line of SPMTs supported a steel beam that ran along the bridge's width. Shims were used between the top of the steel beam and the underside of each concrete beam to accommodate differences in elevation.



The superstructure's twist tolerance of 2 in. was continuously monitored throughout the move using taut piano wires. The wires were set about 2 ft off the bridge deck between diagonal corners and consisted of upper and lower line limits across one diagonal and a measurement line across the other diagonal. If the measurement line approached the limit lines, the SPMT was stopped so adjustments could be made.

Sources:

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What Are Implements of Husbandry and What is Wisconsin's New Policy?

An implement of husbandry is a piece of equipment or machinery exclusively designed and used for agricultural purposes. Some examples of implements of husbandry include tractors, grain haulers, front-end loaders and hay bailer.

Farm equipment used by businesses that commercially provide agricultural services to farms fall under the category of "commercial implements of husbandry." Some examples of commercial implements of husbandry include manure spreaders, fertilizers/sprayers and grain grinders.

Increases in the size and weight of implements of husbandry have evolved over time. This is due to the creation of larger operations and newly found efficiencies developed to increase productivity in the field. As a result, much of the equipment to support the increased efficiency and productivity is unsuitable for use on public roads and bridges.

The Implements of Husbandry (IoH) Study Group was formed in the fall of 2012 by the Wisconsin Department of Transportation (WisDOT) and the Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP). The IoH Study Group was created to study issues related to the weight and size of IoH, issue best practices, and make recommendations to the Wisconsin Legislature. Farm equipment manufacturers, farmers, manure haulers, private dealers and representatives from local government organizations participated in the IoH Study Group.

The IoH Study Group began its deliberations with efforts to ensure that the entire group had an appropriate understanding of the current fleets of equipment, modern agriculture needs, and weight capacity of roads and bridges. This first phase of the study also categorized IoH into four classifications:

Category I: IoH Prime (Tractors)

Category II: Self Propelled IoH (combines, terragators, etc.)

Category III: Commercial Vehicles or Converted IoH (homemade trucks hauling manure and forage)

Category IV: IoH Trains (a train of IoH vehicles pulled by a tractor)

The second phase of the IoH study included additional research and the creation of balanced policy solutions, keeping in mind the concerns of the agricultural industry and the need to protect Wisconsin's roads and bridges. In addition to the IoH Study Group's pavement and structural analysis, the study group also considered research that has been conducted elsewhere.

The IoH Study Group forwarded a series of recommendations to the Wisconsin State Legislature for its consideration. The recommendations were introduced as legislation (Senate Bill 509) by Rep. Ripp and Sen. Petrowski and supported by the Wisconsin Counties Association. Senate Bill 509 was signed into law on April 23 by Governor Walker (2013 Wisconsin Act 377).

The new policy includes an "opt in" policy for locals on Category II IoH. The weight allowance and permit system both "sunset" after five years, forcing the State Legislature to examine the policy at that time. Previous weight limits provided for an allowance of 80,000 lbs. on unposted roads or roads with out exemptions on five axles. Additionally, a maximum of 20,000 lbs. is allowed per axel.

The new law makes several additional changes:

- Width envelope: IoH operating on the highway exceeding 15 ft. in total width or extending over the center of the road are subject to the following:



- Two amber flashing warning lamps visible (front and rear)

- Two red retro-reflective devices (rear)

- Red retro-reflective conspicuity material (rear)

- Two strips of yellow retro-reflective material (front)

- Height envelope: Height of IoH – 13 feet 6 inches; however, an IoH greater than 13 feet 6 inches may operate without written authorization. In this case the IoH operator is responsible for ensuring there are no conflicts with overhead obstructions, such as wires or structures.

- Weight Limits: Agricultural vehicles are subject to state weight limits under Wis. Statutes 348.14. Typically these weight limits are 20,000 lbs. per axle with a maximum of 80,000 lbs. on five axles or more. The crafted policy signed into law gives IoH an additional 15% weight allow-

ance over these established weight limits. It is important to note the local units of government still maintain local control over their own roads. Locals may post stricter weight limits beyond what the state has authorized where they have jurisdiction.

- Penalties: If an operator exceeds the 15% buffer, the operator is penalized from the original state limits of 20,000 lbs. per axle and the 80,000 lbs. gross weight limit. This provision was included in the new policy to ensure that the 15% allowance becomes the ceiling and not the floor. The IoH Study Group established the recommendation of a 15% buffer after a review of engineering studies showing that this allowance is an acceptable weight threshold for most highways.

For more information on the Implements of Husbandry Study Group and its recommendations, please visit www.dot.wisconsin.gov/business/ag/index.htm

Faces of Wisconsin Counties Association



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Oconto Falls High School Successful Motorcycle Program



Even though, it may be unimaginable that a small community 30 miles from the nearest motorcycle dealership would have state of the art motorcycle program, that's the case with the Tech. Ed. Department at the Oconto Falls High School.

The District has had a long running partnership with a motorcycle company that goes back to August 1997 when Instructor Tom Karban left the papermaking industry to step foot in the Tech Ed. Classrooms at Oconto Falls High School. Always a lifelong learner, Karban took a summer motorcycle

class designed for Tech. Ed. Instructors. After completing the class, he was able to secure the donation of a couple of motorcycles and that was the start of the a saga that has grown year after year to an outstanding program recognized statewide and nationally for the work that students have done in that department.

We have also established a working relationship with a local motorcycle company. As many as five former Oconto Falls high school students have worked for the them as service technicians and service managers. The companies service technicians have shared

their talents with students at Oconto Falls by helping out in the classroom. Karban stated that the most rewarding aspect of his job is seeing students pursue their passion and make a great living doing it.

In the past, many small engine programs in the past have been settings in which students bring non-running lawn mowers from home and rebuild them. The culmination of the instruction sequence at Oconto Falls High School involves completing tearing down a new motorcycle and ultimately putting the motor and the machine back together. The past/fail test of that work is whether or not the familiar motorcycle rumble can be heard when start button is pushed.

The program has been featured at statewide conventions. Partnerships have been established with two Harley dealerships where Oconto Falls High School students have found employment. Karban's expertise is valued so much on the state level that he coordinates an annual Motorcycle Service Competition where students in high school and technical colleges face off to win the right to compete at the national level.

The donated motorcycles cannot be licensed to run on the highways and are intended to be used by students to increase their knowledge and skills set in preparation for further education or work after high school.



In addition to building on the partnership with a local motorcycle company, the program has partnered with other engine and parts companies to expand the learning opportunities for students.

The Oconto Falls Tech. Ed. Department was the 2004 Tech. Ed. Program of the Year. In 2007, Karban was selected as the State of Wisconsin High School Teacher of the Year. The influence of this program has extended beyond the walls of Oconto Falls High School in a number of different ways.

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Specifically, in addition to preparing you to teach a variety of topics about technology in junior and senior high school settings, the Technology Education program also provides a rich background in training and technology that can be applied to careers in business and industry. Combining general and professional teacher education

courses with the study of concepts and skills native to timeless, as well as cutting edge technologies, is a distinguishing feature of this program.

Most of our graduates find jobs teaching industry and technology based subjects at the junior or senior high school level. Some graduates who have industrial experience are hired as instructors in various vocational/technical school programs. Because of the technical expertise of our graduates, others find employment in business and industry.

Starting salaries of 2012-2013 graduates ranged from \$32,000 to \$50,000, with recent graduates reporting even higher contract amounts. These contracts are for an academic school year (9 months), which allow you to pursue other personal and professional goals during the summer months.



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www.uwstout.edu/dm/bste.cfm

Students at Red Smith School Build an Electric Car from a Wheelchair



In Mr. Terry Auger's advanced math & science applications class at Red Smith School in Green Bay, the curriculum is anything but ordinary. Instead of working on math and science problems that tend to put even the brightest middle school kids to sleep, students spend their class time learning about architecture, airplanes, global warming, and much more. The most exciting project of all, however, is building an electric car from a wheelchair.

Donated by Bellin Regional Health in Green Bay, the seventh and eighth grade students began their project by stripping down a used Ranger X electric wheelchair. For several weeks, students learned real-world machining and wood-working skills such as cutting, grinding and sanding to build their electric car; all under Mr. Auger's watchful eye. When

the project was complete, the students proudly displayed their electric car at Red Smith's annual science fair on April 17.

"I think it was a really fun project, I would recommend it to anyone," said Will Laabs, an eighth grader at Red Smith. "The car can go six miles per hour, it has a joystick controller, and it even has a horn."

This is the third electric car Red Smith students have built, and Mr. Auger still relishes how much the students enjoy the project. "The kids love it," said Terry Auger, Ph.D. "The word 'applied' means a lot in our class; students are able to apply every single concept they learn into a real-life situation or project. We don't do this enough in our teaching."

Eighth grader Solomon Costa would agree. "Building the car was such

a fun experience," Costa said. Although the students enjoy building the electric car each year, there are other aspects of the class that are exciting as well.

Each year students get their own flying lessons, and help plan the all-school science fair. Heading up this year's fair was Costa and his classmate, Cassandra Marin. Science fair projects included research about plants, rockets, the solar system, crystals, robots, slime and much more. With young scientists like Costa, Laabs and Marin, and teachers like Mr. Auger, the future of science and innovation looks bright!

www.greenbay.k12.wi.us/MS/RedSmith

News for Electric Vehicles



Electric vehicles and the "smart grid" are emerging as one of the main solutions to lower dependence on foreign oil and to reduce emissions of harmful pollutants and greenhouse gases. Electric vehicles are gaining popularity among environmentally conscious consumers, but are limited by their driving and range performance as well as their higher than average relative sticker price.

The auto industry is reacting to consumers' growing environmental consciousness and price sensitivity, as well as to stricter federal fuel efficiency standards, which will rise from 2011's fleet average of 27.3 mpg to 54.5 mpg by 2025. The industry has responded to new government standards by enhancing the fuel efficiency of conventionally fueled light passenger vehicles, as well as improving electric vehicle technology.

EVs get "cleaner" over time, as electri-

cal power generation begins to convert slowly over time to lower-polluting energy sources. Vehicle electrification and connected charging infrastructure applications may establish a significant foundation for the "smart grid" in the long term. EV batteries may act critical energy storage devices in industrial and residential infrastructure to provide backup power, improving the resiliency of the energy distribution system. EV batteries in the long term may capture and store renewable sources of energy, such as wind and solar power generation, which cannot be tapped in response to demand and require considerable energy storage. The vision is that as battery technology improves, Vehicle-to-Grid (V2G) applications may be calculated on pre-trip prospective vehicle miles traveled (VMT), selling back whatever charge that is not needed to complete given day's journey. EVs could then collectively act as spinning or fre-

quency-response reserves for utilities that could counteract disruptions in generating capacity or spikes in electricity demand.

A new way to recharge

Range anxiety and limited charging infrastructure are among the reasons some consumers don't consider buying an electric vehicle. Those two concerns are related, because if there's no place to charge an E.V. it will affect the distance a driver can travel.

A new type of charging cord that will allow E.V. users to recharge anywhere. With a dual-voltage setting, 120 volts and 240 volts AC, the cord could broaden E.V. charging options from the current charging stations equipped with those funny-looking plugs that connect to E.V. charging ports.

The dual-voltage charger will be available for about \$650 and a 240-volt-only version will be available for about \$600. Using 240-volt outlets — typically used for clothes driers and other large appliances — full battery-electric vehicles can be charged in about six hours and plug-in hybrids in about three.

Electricity Costs for Charging

The fuel efficiency of an all-electric vehicle may be measured in kilowatt-hours (kWh) per 100 miles rather than miles per gallon. To calculate the cost per mile of an all-electric vehicle, the cost of electricity (in dollars per kWh) and the efficiency of the vehicle (how much electricity is used to travel 100 miles) must be known. If electricity costs \$0.11 per kWh and the vehicle consumes 34 kWh to travel 100 miles, the cost per mile is about \$0.04.

If electricity costs \$0.11 per kilowatt-hour, charging an all-electric vehicle with a 70-mile range (assuming a fully depleted 24 kWh battery) will cost about \$2.64 to reach

a full charge. This cost is about the same as operating an average central air conditioner for about 6 hours. To compare the fueling costs of individual models of conventional and plug-in vehicles, see the Vehicle Cost Calculator — www.afdc.energy.gov/calc/.

For EV and PHEV charging, the stability and planning benefits of household electricity rates offer an attractive alternative compared to traditional petroleum-based transportation. Learn more from Idaho National Laboratory's report: avt.inel.gov/pdf/fsev/costs.pdf

Occupations associated with electric vehicles

Electrical Engineer

- Median wages (2012) \$42.27 hourly, \$87,920 annual
- Secondary education required

Energy Engineers

- Median wages (2012) \$44.24 hourly, \$92,030 annual
- Secondary education required

Automotive Technician

- Median wages (2012) \$17.60 hourly, \$36,610 annual
- Some secondary education or apprenticeship is desirable

Industrial Ecologists

- Median wages (2012) \$30.56 hourly, \$63,570 annual
- Secondary education required

Electricians

- Median wages (2012) \$23.96 hourly, \$49,840 annual
- Some secondary education or apprenticeship is desirable

www.onetcenter.org/online.html

Read more about the "Smart Grid" on page 10

Transportation Program at Oshkosh West



What has more electrical technology than the Apollo 9? Your car! That is the idea students are receiving in Mr. Boushele's Transportation courses at Oshkosh West High School. "One of the most technologically sophisticated things we commonly use today is an automobile," said Mark Boushele, lead instructor in the OWSH Transportation program. "A fundamental understanding of electricity and electrical concepts is of central importance for anyone who is considering a career path in transportation today."

That is why Mr. Boushele is working with his students to develop their skills in electricity related to automobiles. Stu-

dents use a variety of learning strategies and tools including digital multimeters, test lights and building electrical circuits on a specially designed electrical training bread board.

"Learning about electricity is easy when I use the training bread board. I am able to build circuits that are used in the real world" says Jack Binder, senior at Oshkosh West. "I used what I learned in school at work while to fixing a problem with a wheel speed sensor. I understood the problem."

Learning about electricity is easier when it can be broken down into smaller problems and when the entire circuit is right in front of students to see and manipulate.

Andrew Borgardt says that learning to use a digital multimeter was easy when he could see the circuit. "All that information in the book seemed simple when I built the circuits for me to test and measure. Now it makes sense when the meter reads a voltage and the switch is off."

Students are always working with stereos, specialty lighting and problems



under the hood that pertain to electricity. Even tires have TPMS systems that need to be serviced. As students progress in their studies, the use of sophisticated diagnostic tools measure and display a variety of electrical signals from every system in a car. As cars continue to incor-

porate more electrical technology, we may see an electric car that can fly to the moon!

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In 2008, a small group of Technology & Engineering instructors from Green Bay, West De Pere and Ashwaubenon set out to develop an engineering and manufacturing competition that blended what was being taught in the school, apply it to a fun and exciting project, and allow teams of students a chance to test their project under real-world conditions. That competition was soon to be known as Formula High School.

Formula High School is a competition open to high school students that challenges the students to use their engineering and manufacturing skills to design, build and test their own race vehicle. The vehicles must meet a strict set of safety rules, be built to with certain materials, and then are tested one at a time on the track against the clock. Teams are awarded

Formula High School in its 6th Year!

“bragging rights” for the year if their team of three different drivers posts the lowest average time. This allows all teammates a chance to drive their vehicle on the track without worrying about a time penalty.

Now in its 6th year, students involved in FHS are allowed a choice of three different classes of vehicles to construct: Formula Stock, Formula Modified, and Formula Prototype. The Formula Stock class utilizes an open wheel fiberglass body, a 16 HP Briggs & Stratton engine, and no suspension. This design also uses common VW Beetle front spindles and brakes to help keep costs down. The Formula Modified class allows teams to use a suspension and mild engine changes to the same style of car. The top class is Formula Prototype. This is a full independent front and rear suspension vehicle using a higher horsepower engine. This class also uses a full fendered bodyshell. The Prototype division allows teams the flexibility in using their engineering skills to solve complex manufacturing problems. To keep speeds in check, all classes must follow strict RPM limits to restrict top speeds of the vehicles.

If a team chooses they can come to Green Bay and lay up their own body shell under the direction of a local fiberglass company. Once the bodies are removed from the molds, the students are responsible for trimming and



fitting the panels to their chassis and properly finishing them. This also gives the students and their advisors a chance to learn composite techniques.

The chassis for these vehicles are also based on original race vehicles. Students receive a 3D computer model of the main cockpit section of the chassis. It is up to the teams to use their school's CAD systems to develop their own blueprints. This again ties what is being taught in the classroom to a real-world problem. The CAD model also ensures proper placement of roll bars and bracing so the vehicles are safe. The students then use

computer-modeling software to design the rest of their chassis. If a team runs into trouble solving a problem, advice and help is just an email or phone call away to any of the other FHS advisors around the state.

More schools are getting involved each year. FHS now has teams in Indiana, Arizona and teams will soon be involved in Australia.

Now . . . why didn't they have something like this when I was in school?

formulahighschool.com

The Smart Grid

Our current electric grid was built in the 1890s and improved upon as technology advanced through each decade. Today, it consists of more than 9,200 electric generating units with more than 1 million megawatts of generating capacity connected to more than 300,000 miles of transmission lines.

Although the electric grid is considered an engineering marvel, we are stretching its patchwork nature to its capacity. To move forward, we need a new kind of electric grid, one that is built from the bottom up to handle the groundswell of digital and computerized equipment and technology dependent on it—and one that can automate and manage the increasing complexity and needs of electricity in the 21st Century.

What Makes a Grid “Smart?”

In short, the digital technology that allows for two-way communication between the utility and its customers, and the sensing along the transmission lines is what makes the grid smart. Like the Internet, the Smart Grid will consist of controls, computers, automation, and new technologies and equipment working together, but in this case, these technologies will work with the electrical grid to respond digitally to our quickly changing electric demand.

What does a Smart Grid do?

The Smart Grid represents an unprecedented opportunity to move the energy industry into a new era of reliability, availability, and efficiency that will contribute to our economic and environmental health. During the transition period, it will be critical to carry out testing, technology improvements, consumer education, development of standards and regulations, and information sharing between projects to ensure that the benefits we envision from the Smart Grid become a reality. The benefits associated with the Smart Grid include:

- More efficient transmission of electricity
- Quicker restoration of electricity after power disturbances
- Reduced operations and management costs for utilities, and ultimately lower power costs for consumers
- Reduced peak demand, which will also help lower electricity rates
- Increased integration of large-scale renewable energy systems
- Better integration of customer-owner power generation systems, including renewable energy systems
- Improved security

For more information on the “Smart Grid” visit www.smartgrid.gov

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The History of Asphalt

Laura Ingalls Wilder, author of the beloved *Little House on the Prairie*, tells of her first encounter with an asphalt pavement. She was on a wagon journey with her parents in 1894 that took them through Topeka.

"In the very midst of the city, the ground was covered by some dark stuff that silenced all the wheels and muffled the sound of hoofs. It was like tar, but Papa was sure it was not tar, and it was something like rubber, but it could not be rubber because rubber cost too much. We saw ladies all in silks and carrying ruffled parasols, walking with their escorts across the street. Their heels dented the street, and while we watched, these dents slowly filled up and smoothed themselves out. It was as if that stuff were alive. It was like magic."

Today, this dark, resilient material covers more than 94 percent of the paved roads in the United States; it's the popular choice for driveways, parking lots, airport runways, racetracks, tennis courts, and other applications where a smooth, durable driving surface is required. Called at various times *asphalt pavement*, *blacktop*, *tarmac*, *macadam*, *plant mix*, *asphalt concrete*, or *bituminous concrete*, asphalt pavements have played an important role in changing the landscape and the history of the U.S. since the late 19th century.

Laying the Foundation for Asphalt Roads

Despite these early uses of asphalt, several hundred years passed before European or American builders tried it as a paving material. What they needed first was a good method of road building.

Englishman John Metcalf, born in 1717, built 180 miles of Yorkshire roads. He insisted on good drainage, requiring a foundation of large stones covered with excavated road material to raise the roadbed, followed by a layer of gravel. Thomas Telford built more than 900 miles of roads in Scotland during the years 1803–1821. "He perfected the method of building roads with broken stones, laid to a depth according to the weight and volume of traffic it would have to carry," Gillespie writes.

Telford's contemporary, John Loudon McAdam, taught himself engineering after being appointed a trustee of a Scottish turnpike. McAdam observed that it was the "native soil" that supports the weight of traffic, and that "while it is preserved in a dry state, it will carry any weight without sinking." To construct his roads, McAdam used broken stone "which shall unite by its own angles so as to form a hard surface." Later, to reduce dust and maintenance, builders used hot tar to bond the broken stones together, producing "tarmacadam" pavements.



Dumping hot-mix asphalt. Photo Courtesy NAPA

Asphalt Roads Come to America

The first bituminous mixtures produced in the United States mixes were used for sidewalks, crosswalks, and even roads starting in the late 1860s. In 1870, a Belgian chemist named Edmund J. DeSmedt laid the first true asphalt pavement in this country, a sand mix in front of the City Hall in Newark, New Jersey. DeSmedt's design was patterned after a natural asphalt pavement placed on a French highway in 1852.

DeSmedt went on to pave Pennsylvania Avenue in Washington, DC, a project that included 54,000 sq. yds. paved with sheet asphalt from Trinidad Lake Asphalt. The durability of this pavement proved that the quality of the asphalt found in the Americas was as good as that imported from Europe.

Pavements being built today can be engineered to meet a variety of needs — for less noise, greater durability, enhanced skid resistance, reduced splash and spray in rainy weather, and a smoother ride than ever before.

The asphalt street laid 130 years ago in Newark bore little resemblance to today's asphalt superhighways. But with the constant improvements in production and equipment, and with the continued emphasis on quality, we, too, may look back before too many years have passed and realize how much progress we have made in increasing the durability, safety, and smoothness of asphalt roadways.

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94% of roads in America are surfaced with asphalt.
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The Wisconsin Asphalt Pavement Association is a statewide, non-profit organization representing the interests of the asphalt industry. WAPA members are Wisconsin-based contractors and manufacturers, asphalt mixture producers and liquid asphalt suppliers who support the industry by providing quality pavements, materials and services.



WAPA

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Learn more about careers in asphalt and find job openings at: asphaltcareers.org

WISCONSIN RIDES ON US

Birchwood Competes with a High Mileage Vehicle

Written by Jennah Henk

Birchwood High School has taken part in the High Mileage Vehicle for over 10 years. Each year students get together and build or remodel a HMV car to try to get more miles per gallon than the year before. Last year our team started from scratch and built a new HMV car to compete with. This year we have fixed its problems and are ready to compete with it again. Students get to learn hands-on and work together as a team. We spend each class time we can to work on the HMV cars and sometimes a few hours after school. It's in these times that we bond and grow as a team.

We started out going to UW-Stout in Menomonie and now we race at a track in Minnesota. We compete with other high schools around the area. In 2011 a group of 14 students and 3 adults went to Houston, Texas and competed against colleges and got a record of 962 mpg. This year, on May 12 through the May 14, 2014, we are going back to Minnesota to try and beat our 757 mpg record from 3 years ago. Driving a HMV car is quite a bit different than normal. The driver is actually lying

back mostly with his/her feet straight in from of them. Once they start going on the track the driver gets the car up to about 30 mph and shuts the engine off. They will then coast down until the engine is needed. They repeat this process a few times each run. As soon as each run is done we remove the gas bottle and give it to a volunteer at the track to weigh and measure our miles per gallon. If your car is running correctly you should improve your MPG with every run. Whether we beat our record or we barely make it around the track we have fun and learn something new every day.

For our school it is a class that lasts all year long. If students want to be involved they must take one of the HMV classes allowed. There are 7 students involved this year; seniors are Cody, Vanessa, and Katie. Juniors are Sarah, Joe, and Tanner. The only sophomore is Jennah. This group is not offered to freshmen in order to let them focus more their school work and get in the high school groove.

This event actually takes place over three days. On day one we go through technical inspection on every car and make sure we have all the necessary safety requirements. Day two is when the



trials begin. Each run is two laps around the track. After each run we give our one gallon, gas bottle to the computer trackers and they weigh it right there to tell us our gas mileage. If there are any problems with the cars we are able to fix them between each run, in our pit area. Then after 2 pm on May 14 the track closes, presentation of awards to the winning Minnesota schools.

If you are interested in coming and cheering us on, check with Birchwood High School for directions.

www.birchwood.k12.wi.us

Automotive Education at Eleva-Strum

Continued from Page 1

Cegielski's automotive class will cover basic general maintenance areas, such as roadside emergencies, home tune-ups, and part replacement. Cegielski wants students to be able to identify minor problems in their vehicle and to understand how to fix them.

In addition, Cegielski hopes to partner with local businesses to educate students about the financial side of owning a vehicle. "We'll bring in a local bank and talk about purchasing and loans," Cegielski explained. "We'll bring in a local dealership and talk about buying and selling." Cegielski also hopes to enlist the help of insurance agencies in the area to cover that aspect of ownership.

To teach this class to its full potential, Cegielski will be using the lift several times a week. "[The lift] is going to be a great demonstration piece," said Cegielski. Instead of trying to cram fifteen students under a single car to examine an exhaust system, the lift will allow Cegielski to teach without such restraints. "We're going to be putting different cars up and lifting them, and when we're talking about tires, it'd be nice to have [the tire] up at eye-level," Cegielski said. "When we're

talking about brake systems, you can go there, pull the tires off, and look at it at a good level." Cegielski also stated that further on in the class, students will be bringing in their own vehicles to perform the maintenance they've been taught on the vehicles.

With this program, Cegielski hopes to tap into the student section that doesn't regularly take shop classes. All students would benefit highly from a general maintenance course, and this is exactly the aim Cegielski has in mind. His goal is always to garner further interest in the Tech Ed program. As he states, the Eleva-Strum shop's belief is to always, "expand, expand, expand, improve, and keep buying better equipment. This is one more way to better prepare students for their futures."

www.esschools.k12.wi.us

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email: admissions@uwsuper.edu

Designing and Constructing Concrete Highways for a Long Life in Wisconsin



Kevin W. McMullen, P.E.
President
Wisconsin Concrete Pavement Association

It is a common goal between the public, the Wisconsin Department of Transportation and the construction industry to build new roadways in Wisconsin that last as long as possible. I am often asked how the concrete paving industry achieves this goal. Wisconsin has a large range of temperatures,

weather and seasonal variations that seem to take the life out of roads. This is especially evident this spring as we are now seeing the impacts of the 2013-2014 winter. In addition, the public is noticing more and more trucks on the roads. That has to have an impact as well? I will be discussing a few of the basic premises that we hold firm to assure we meet the goal.

The highest quality grade possible to

build a pavement on is the first premise. The big dirt moving equipment is one of the early operations in the construction of any road. While most people look at these operations and see new alignments for the roadway develop, the pavement engineer is looking at the soils and characterizing them for support value to the pavement. The goal is to remove all poor and weak soils and construct good and consistent support for the pavement.

An excellent base layer constructed for the pavement is the second premise. All pavements are built on crushed stone or crushed gravel bases. They are typically six to 12 inches in thickness. This is a structural layer that separates the pavement from the weak soils. Concrete spreads a heavy load out over a wide area. This base has to be strong enough to support that load and not damage the soil grade beneath it. In general, the weaker the soils the thicker the base layer becomes. So, sand is a good soil and require thin base layers and clays and silts are poor soils and require thicker base layers. In addition, it is a platform to facilitate construction of the concrete pavement. Many times, it is also a drainage layer to reduce the impacts of water and the annual frost heave each winter.

Strong and durable concrete to withstand loading, freeze-thaw impacts and

chemicals damage is the third premise. We test concrete strength in compression and flexure to assure it has sufficient strength to withstand the truck loadings. Compressive strength insures that the concrete does not crush under the load and flexural strength insures that the load does not bend the concrete causing it to crack. The design strengths for concrete are 4,500 pounds per square inch (psi) for compressive strength and 650 psi for flexural strength.

We design concrete to be as impermeable to water as possible. If a concrete is impermeable to water, it becomes insensitive to freezing temperatures and it also keeps the chemicals like deicing salts out of the concrete that causes it to deteriorate over time. We have made great strides in this area over the last few decades by using the fly ash from the electric generating plants as a supplementary cementitious material. Utilization of this waste has helped us reduce permeability by magnitudes. The result should be longer life more durable concrete.

We cannot keep water out of the concrete completely. So, we produce a small micro bubble air system in the concrete paste so that when the water freezes and

Continued on Page 17



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Pictured Here: Capitol Drive in the City of Milwaukee. It was constructed by the City of Milwaukee and by WCPA member the Zignego Company. It was the recipient of a 2013 Gold Award for Excellence in Concrete Pavement in the Category of Municipal Streets and Intersections, Greater than 30,000 SY..

How Airplanes Work

By Marshall Brain, Robert Lamb and Brian Adkins

Human flight has become a tired fact of modern life. At any given moment, roughly 5,000 airplanes crisscross the skies above the United States alone, amounting to an estimated 64 million commercial and private takeoffs every year [source: NATCA]. Consider the rest of the world's flight activity, and the grand total is incalculable.

It is easy to take the physics of flight for granted, as well as the ways in which we exploit them to achieve flight. We often glimpse a plane in the sky with no greater understanding of the principles involved than a caveman.

How do these heavy machines take to the air? To answer that question, we have to enter the world of fluid mechanics.

Physicists classify both liquids and gases as fluids, based on how they flow. Even though air, water and pancake syrup may seem like very different substances, they all conform to the same set of mathematical relationships. In fact, basic aerodynamic tests are sometimes performed underwater. To put it simply, a salmon essentially flies through the sea, and a pelican swims through the air.

The core of the matter is this: Even a clear sky isn't empty. Our atmosphere is a massive fluid layer, and the right application of physics makes it possible for humans to traverse it.

How Do Planes Fly: Thrust and Drag

Drop a stone into the ocean and it will sink into the deep. Chuck a stone off the side of a mountain and it will plummet

as well. Sure, steel ships can float and even very heavy airplanes can fly, but to achieve flight, you have to exploit the four basic aerodynamic forces: lift, weight, thrust and drag. You can think of them as four arms holding the plane in the air, each pushing from a different direction.

First, let's examine thrust and drag. Thrust, whether caused by a propeller or a jet engine, is the aerodynamic force that pushes or pulls the airplane forward through space. The opposing aerodynamic force is drag, or the friction that resists the motion of an object moving through a fluid (or immobile in a moving fluid, as occurs when you fly a kite).

If you stick your hand out of a car window while moving, you'll experience a very simple demonstration of drag at work. The amount of drag that your hand creates depends on a few factors, such as the size of your hand, the speed of the car and the density of the air. If you were to slow down, you would notice that the drag on your hand would decrease.

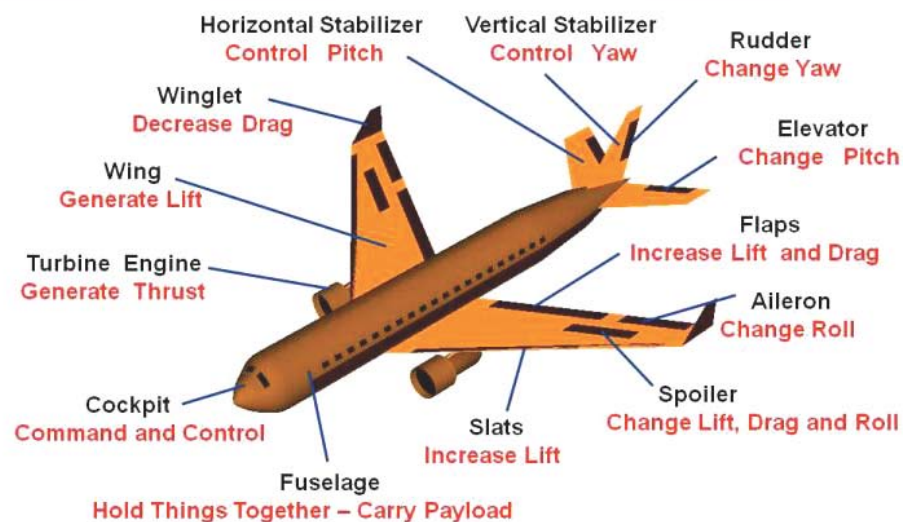
We see another example of drag reduction when we watch downhill skiers in the Olympics. Whenever they get the chance, they'll squeeze down into a tight crouch. By making themselves "smaller," they decrease the drag they create, which allows them to zip faster down the hill.

A passenger jet always retracts its landing gear after takeoff for a similar reason: to reduce drag. Just like the downhill skier, the pilot wants to make the aircraft as small as possible. The amount of drag produced by the landing gear of a jet is so great that, at cruising speeds, the gear would be ripped right off the plane.



National Aeronautics and Space Administration

Airplane Parts and Function



www.nasa.gov

For flight to take place, thrust must be equal to or greater than the drag. If, for any reason, the amount of drag becomes larger than the amount of thrust, the plane will slow down. If the thrust is increased so that it's greater than the drag, the plane will speed up.

How Do Airplanes Fly: Weight and Lift

Every object on Earth has weight, a product of both gravity and mass. A Boeing 747-8 passenger airliner, for instance, has a maximum takeoff weight of 487.5 tons (442 metric tons), the force with which the weighty plane is drawn toward the Earth.

Weight's opposing force is lift, which holds an airplane in the air. This feat is accomplished through the use of a wing, also known as an airfoil. Like drag, lift can exist only in the presence of a moving fluid. It doesn't matter if the object is stationary and the fluid is moving (as with a kite on a windy day), or if the fluid is still and the object is moving through it (as with a soaring jet on a windless day). What really matters is the relative difference in speeds between the object and the fluid.

As for the actual mechanics of lift, the force occurs when a moving fluid is deflected by a solid object. The wing splits the airflow in two directions: up and over the wing and down along the underside of the wing.

The wing is shaped and tilted so that the air moving over it travels faster than the air moving underneath. When moving air flows over an object and encounters an obstacle (such as a bump or a sudden increase in wing angle), its path narrows and the flow speeds up as all the mole-

cules rush through. Once past the obstacle, the path widens and the flow slows down again. If you've ever pinched a water hose, you've observed this very principle in action. By pinching the hose, you narrow the path of the fluid flow, which speeds up the molecules. Remove the pressure and the water flow returns to its previous state.

As air speeds up, its pressure drops. So the faster-moving air moving over the wing exerts less pressure on it than the slower air moving underneath the wing. The result is an upward push of lift. In the field of fluid dynamics, this is known as Bernoulli's principle.

Brain, Marshall, Robert Lamb and Brian Adkins. "How Airplanes Work" 26 May 2011. HowStuffWorks.com



[science.howstuffworks.com/
transport/flight/modern/
airplanes.htm](http://science.howstuffworks.com/transport/flight/modern/airplanes.htm)

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Milwaukee County's General Mitchell International Airport, the largest and busiest airport in Wisconsin, offers a number of family-friendly trips and educational experiences for kids and adults of all ages. Whether it's an exciting trip to the many attractions near Orlando, sightseeing in the nation's capitol, star-gazing in Hollywood, visiting the Statue of Liberty in New York, or walking the Freedom Trail in Boston, Mitchell Airport can help you get there with nonstop flights to 36 destinations across North America.

Mitchell Airport is named after General William "Billy" Mitchell, a United States Army general who grew up in Milwaukee County and is widely regarded as the father of the U.S. Air Force. Owned and operated by Milwaukee County, Mitchell Airport served more than 6.5 million passengers in 2013. Mitchell is the only airport in Wisconsin or Illinois with service from all the major domestic airlines

Learning about the many different career tracks available in aviation is exciting! Mitchell Airport is served by Air



Canada, AirTran, American, Delta, Frontier, Southwest, United, and US Airways, as well as cargo carriers FedEx and UPS.

Pilots and flight attendants get to see the world as part of their jobs. Airlines also employ customer service representatives, gate agents, baggage handlers, and mechanics. Many airlines provide excellent travel benefits for their employees, too.

The airport itself is staffed by Milwaukee County employees, including maintenance workers that maintain the airfield, plow snow in the winter, and keep the grass cut during the summer. The Airport's 24/7 fire department responds to paramedic calls on airport property, while the Milwaukee County Sheriff's Department is the primary law enforcement agency.

Federal employees based at the airport include Federal Aviation Administration air traffic controllers, Transportation Security Administration (TSA) screeners, and U.S. Customs and Border Protection officers. The 128th Air Refueling Wing of the Wisconsin Air National Guard, located on the east side of the airfield, conducts frequent training missions using KC-135 aircraft.

Some jobs don't directly relate to aviation, but it's still fun to work at the airport in other capacities. Hundreds of people work at Mitchell Airport's shops, restaurants, rental car companies, bank, and shoe shine business located in the terminal. Renaissance Books is probably the only used bookstore you'll ever find at an airport, and it has a great children's section. In addition, Mitchell Airport recently completed a remodeling of its three children's play areas. There's one on each of the three concourses.



Visit mitchellairport.com to view a route map and see where Mitchell Airport can take you! Click on Airport Information/Airport Programs to download a self-guided tour booklet, and spend some extra time in the terminal before your flight. There is a fun, free museum called the "Mitchell Gallery of Flight." It's great for all ages.

Mitchell International is conveniently located off of I-94 south of downtown Milwaukee. There is plenty of affordable parking with a free shuttle to the terminal. The airport even has its own stop on Amtrak's Hiawatha line!

Fly nonstop from Milwaukee coast-to-coast, including Boston, Washington D.C., Seattle, San Francisco, New York, Fort Lauderdale and 30 other destinations. Plus, you can conveniently connect to hundreds of additional destinations worldwide. It'll cost less, too! Fares from Milwaukee are \$38 less than the national average. Wherever you need to go, Mitchell Airport offers low fares and an easy travel experience for families.

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Career Myths

X Myth — *If I wait long enough, luck will eventually bring me to the right career.*

✓ Fact: Most people will benefit from a plan -- a full investigation and thorough consideration of different occupations. It is unlikely that you will just “bump into” the occupation that will perfectly match your skills and interests or satisfy your most important values. The more information you gather about yourself and the occupations you are considering, the more likely it is you will make a wise career decision. It is true that some things beyond your control will influence your life, but you must take an active role to determine your own fate. Look around you - those people who are unhappy in their careers most likely just “fell into” something without careful planning.

X Myth — *Most people have a solid understanding of careers and the world-of-work and if I don't, then I am the only one who is confused!*

✓ Fact: People's knowledge of occupations is often incomplete. Most of what passes as knowledge is really based upon stereotypes. The media may depict police work as an exciting occupation dedicated to putting the bad guys behind bars. They are less likely to



show the hours spent doing paperwork, directing traffic, or responding to domestic disputes where there is no clearly defined “bad guy.” As you narrow down your options, be sure you are getting a balanced and accurate picture of the occupations you are considering.

X Myth — *Career assessments will tell me exactly what career is right for me.*

✓ Fact: Assessments can provide you with additional information that may be helpful as one part of the career planning process. No test, however, can tell you what

to do with your life or serve up the “perfect” career match. Assessments take a sample of certain kinds of knowledge or attitudes and draw conclusions based on the sample. Test results can be confounded by many things: cultural differences, unrepresentative samples, and unintentionally biased items, to name a few. Use assessments with caution, and critically examine test results with a career counselor in terms of your own experience and knowledge. You know yourself the best.

X Myth — *I should choose an occupation based on my strongest skills.*

✓ Fact: It is risky to consider only your skills for a career decision because skills are just one of the components of a full self-evaluation; interests and values are equally important in the decision making process. What you enjoy and what is important to you about life and work should also be taken into consideration. Just because you are good at something does not mean that you will enjoy doing that activity for a living.

X Myth — *Most students know their major and career goals when they enter college.*

✓ Fact: Some people may have a major or career in mind when they enter college, and a few may actually stick with these original goals. However, the majority of entering college students change their minds about majors and careers several times before graduation. In fact, the average student who enters college with a declared major changes it three to five times. On the other hand, the average student who enters college with an undeclared major changes only one to two times.

From Berkeley University of California

Read more at the website below.

Website: career.berkeley.edu/Article/070119a-sbd.stm

What would you like to do in Transportation?

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- Deck Officer
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- Distribution Manager
- Driver/Sales Representative
- Driver/Sales Workers
- Engineer
- Equipment Director
- Estimating Manager
- Expeditor
- Fleet Manager
- Flight Instructor
- Flight Engineer
- Fork Lift Operator
- Helicopter Pilot
- Import/Export Clerk

- Import/Export Manager
- Import/Export Supervisor
- Industrial Tractor Operator
- Inventory Control Analyst
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- Motorboat Operator
- Motor Racer
- Operations Manager
- Packaging Engineer
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- Shipping and Receiving Supervisor
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- Streetcar Operator
- Subway Operator
- Taxi Driver
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- Traffic/Rate Analyst
- Traffic Clerk
- Traffic Director
- Traffic Manager
- Traffic Supervisor
- Train Crew Member
- Transportation Director
- Transportation Manager
- Transportation Planner
- Transportation Supervisor
- Travel Coordinator
- Travel Manager
- Truck Driver Supervisor
- Van Driver
- Yardmaster

Please note: This represents a broad and not conclusive list of careers within the world of transportation

Explore Transportation Careers at

www.transportationtodaywi.com

Grants

National Robotics Initiative

The goal of the National Robotics Initiative is to accelerate the development and use of robots in the United States that work beside, or cooperatively with, people. Innovative robotics research and applications emphasizing the realization of such co-robots acting in direct support of, and in a symbiotic relationship with, human partners is supported by multiple agencies of the federal government.

Project funding ranges from \$100,000 to \$250,000 per year in direct costs.

Deadline: Proposals are due November 13, 2014, and the second Thursday in November, annually thereafter.

Website: www.nsf.gov/funding/pgm_summ.jsp?pims_id=503641

Innovative Technology Experiences for Students and Teachers (ITEST)

The ITEST program funds foundational and applied research projects addressing the development, implementation, and dissemination of innovative strategies, tools, and models for engaging students to be aware of STEM and cognate careers; and to pursue formal school-based and informal out-of-school educational experiences to prepare for such careers. ITEST supports projects that: (1) increase students' awareness of STEM and cognate careers; (2) motivate students to pursue the appropriate education pathways for STEM and cognate careers; and (3) provide students with technology-rich experiences that develop disciplinary-based knowledge and

practices, and noncognitive skills (e.g., critical thinking and communication skills) needed for entering STEM workforce sectors.

Approximately 15 to 20 Strategies grants, with durations up to three years and total budgets up to \$1.2 million each, will be awarded. Approximately five to 10 SPrEaD grants, with durations of three to five years and total budgets up to \$2.0 million each, will be awarded.

Deadline: Full proposals are due November 6, 2014

Website: www.nsf.gov/funding/pgm_summ.jsp?pims_id=5467

Shell Oil Company Grants

Grant requests related to education must focus on Shell's funding priorities. These include increasing interest in technical careers among students, and professional development in science and mathematics for educators. Funding is provided to support programs in kindergarten through grade 12 that are designed to boost students' mathematics and science skills.

Grant applications are accepted year-round, with a limit of one grant application per organization per fiscal year (September to August).

Website: www.shell.us/environment-society/grant.html

Discovery Research K-12 (DRK-12)

The National Science Foundation

The Discovery Research K-12 program (DRK-12) seeks to significantly enhance the learning and teaching of science, technology, engineering and mathematics (STEM) by pre-kindergarten through grade 12 students and teachers, through research and development of innovative resources, models and tools. The intent of the program is to catalyze new

approaches to STEM learning, develop students' 21st century STEM skills, and provide multiple pathways and resources in a variety of learning environments to study the learning process itself. Projects should be framed around fundamental research in STEM education and prior research and development efforts that provide theoretical and empirical justification for proposed projects.

Exploratory projects of up to \$450,000 with duration of up to three years are awarded; Full Design and Development projects of up to \$3,000,000 with duration of up to four years are awarded; and Conference/Workshop/Synthesis projects of up to \$100,000 for duration of up to two years are awarded.

Deadline: Full proposals are due October 16, 2014

Website: www.nsf.gov/funding/pgm_summ.jsp?pims_id=500047&org=NSF&sel_org=NSF&from=fund

PASCO STEM Educator Awards

The PASCO STEM Educator Awards are presented annually to five teachers to honor excellence and innovation in STEM (science, technology, engineering, and mathematics) education in kindergarten through grade 12. To be eligible, a teacher must have a minimum of three years of experience in the STEM fields and have implemented inquiry-based, technology-infused STEM programs. One elementary, two middle school, and two high school teachers will be selected for the awards.

Five winners will each receive a \$1,000 monetary award, \$1,500 toward expenses to attend the NSTA National Conference, and a \$2,000 certificate for PASCO Scientific products.

Deadline: Nominations are due November 30, annually.

Website: www.nsta.org/about/awards.aspx#stem

Resources

Lesson: Take Off with Paper Airplanes

This lesson introduces students to the art of designing an airplane through paper airplane constructions. The goal is that students will learn important aircraft design considerations and how engineers must iterate their designs to achieve success. Students first follow several basic paper airplane models, after which they will then design their own paper airplane. They will also learn how engineers make models to test ideas and designs.

Website: www.teachengineering.org/view_lesson.php?url=collection/cub/_lessons/cub_airplanes/cub_airplanes_lesson06.xml

Distracted Driving

Distracted driving is a dangerous epidemic on America's roadways. In 2012 alone, 3,328 were killed in distracted driving crashes.

The U.S. Department of Transportation is leading the effort to stop texting and cell phone use behind the wheel. Since 2009, we have held two national distracted driving summits, banned texting and cell phone use for commercial drivers, encouraged states to adopt tough laws, and launched several campaigns to raise public awareness about the issue.

Distraction.gov is your resource for learning more about distracted driving. Get the facts, get involved, and help us keep America's roadways safe.

Website: www.distraction.gov/

Constructing Concrete Highways

Continued from Page 12

expands it does so in the air bubble rather than damaging the concrete. We have been developing these chemical admixtures over time to improve the quality of the air in the concrete.

The other main ingredients in the concrete of crushed stone and sand go through extensive testing by the Wisconsin Department of Transportation to assure that they are high quality, clean and hard materials that are freeze-thaw resistant as well.

Finally, know the number of trucks and what they weigh for proper thickness design is the fourth premise. The Wisconsin Department of Transportation collects huge amounts of data on the traffic on each roadway. These permanent and temporary data collection locations count the numbers of vehicles and classify them by truck type as well. In addition, they have permanent

and temporary weigh-in-motion systems built into pavements across the state and the weigh stations for enforcement. So, we also know the average weight of trucks on the road as well. Through decades of empirical performance we know how many trucks a particular thickness of concrete will be able to carry over its 20 year design life. Every truck imparts a little incremental damage to the pavement as it goes down the road. The damage is accumulated over the 20 year design period and the pavement engineer selects the appropriate thickness of pavement.

Our biggest challenges are collecting all this data, analyzing it and using it to continually improve our design and construction for the future. Another example of how the information technology professionals are impacting our world.

Propane Fueled Squad Cars

Continued from Page 1

product of natural gas processing and crude oil refining.

Propane as an Alternative Fuel

Interest in propane as an alternative transportation fuel stems mainly from its domestic availability, high-energy density, clean-burning qualities, and its relatively low cost. It is the world's third most common engine fuel

Autogas is a mixture of propane with smaller amounts of other gases. According to the Gas Processors Association's HD-5 specification for propane, it must consist of at least 90% propane, no more than 5% propylene, and 5% other gases, primarily butane and butylene. (See fuel properties.)

Propane is stored onboard a vehicle in a tank pressurized to about 150 pounds per square inch—about twice the pressure of

an inflated truck tire. Under this pressure, propane becomes a liquid with an energy density 270 times greater than the gaseous form. Propane has a higher octane rating than gasoline, which can decrease engine knock. However, it has a lower Btu rating than gasoline, so it takes more fuel to drive the same distance. Propane's clean burning characteristics allow the engine to have increased service life.

www.afdc.energy.gov/fuels/propane_basics.html

Wide Base Tires verses Duals

We recently created a questionnaire to find out what Wisconsin-based trucking firms thought of using wide-based tires vs. dual tires on their trucks. John, a fleet manager with a trucking firm, describes their two-year experience with both.



Several years ago we began testing wide base tires on a dedicated fleet operating in south east Wisconsin. The data from the test group was very positive and 3 years ago the power units in this fleet were all converted to wide base tires.

A few of the positive aspects

1. We gained approximately .5 mpg.
2. There was a weight savings of approximately 350 lbs. This included switching the steer tires to aluminum rims also.
3. We saw an increase in miles per 32nd over dual tires.

A few thoughts on performance

1. Initially the drivers were not very receptive to the tires, they have a different feel when driving. You have to remember you have 8 less sidewalls to support you and absorb sideways motion.
2. We have seen a slight reduction in traction when pulling away from docks in winter. Although on highway traction seem to be the same as duals.

Costs

1. Over all the wide base are costing less to run then comparable duals. When you factor in

the increase in mileage, the better tire life and the weight saving allowing more product to be hauled.

2. The one area we do not have enough data on yet is recapping. We have tried several caps and cappers, the results vary considerably. Currently the wide base are capping at about 70%, this is below what we got out of regular tires.

And in all fairness a negative thought

1. When you have a tire issue on the road with a wide based tire you are down were it happens. Prior to going to wide based tires we could limp a driver to the next exit or hopefully to his next stop and then have the tire people meet him to replace or repair the tire. Now when you have an issue you stop and wait for service, there is no moving the truck — we found this out the hard way with one of our drivers! Aluminum rims are expensive.

A final note, we tested wide based tires on trailers also. We did not see any savings and did not convert the trailer fleet. We did however install side skirts and replaced the steel wheels with aluminum wheels for weight.

*John
Fleet Manager*

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and pedestrian
trails



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of rail



131 public
use airports



29
commercial
ports

TRANSPORTATION MOVES
WISCONSIN

Subtle shifts refine big rigs



UW-Stout Assistant Professor Jeanette Kersten, student Matt Mauer and two other students did research on improving cab designs for female truck drivers. As a result of the research, Ryder is considering making changes to its trucks.

By UW-Stout News Bureau

MENOMONIE - Take a look at Jeanette Kersten, and you don't think trucker.

The assistant professor of operations and management for UW-Stout is so slight you would think she'd have a hard time climbing into the cab of an 18-wheeler, much less driving the beast on the open road.

That's the focus of Kersten's research: to make long-haul trucks more accommodating and comfortable for women - a largely untapped, and badly needed, pool of drivers.

"Today's trucks are not designed with women in mind," Kersten said. "Given the driver shortage and the changing demographics that the trucking industry faces, it's important for manufacturers to make trucks more female-friendly through moderate design changes for seats, pedals and gauges, for example."

Kersten, with the assistance of her organization development class graduate students, and Ellen Voie, president for the Wisconsin-based Women in Trucking Association, conducted research that led to major recom-

mendations on improvements in the design of truck seats, dashboards, steering mechanisms and other ergonomics for female drivers.

Kersten will present her paper "Truck Cab Design: Perceptions of Women Truck Drivers" this month at the fifth annual International Conference on Women's Issues in Transportation in Paris.

The trucking industry says that it needs an additional 20,000 to 25,000 drivers, and women could fill that gap. In 2011, women accounted for just 7 percent of the workers in the U.S. trucking industry.

The study Kersten conducted used a questionnaire that went to 663 members of the Women in Trucking Association.

"Adjustability was a central issue facing women truck drivers," the study concluded. "A well-designed truck cab not only makes a significant difference in the working conditions for a truck driver but also affects the safety of truck drivers and other road users."

"If the design of the truck cab is poorly fitted to the size and dimensions of the driver,

the road may be less visible, driving controls may be more difficult to reach and seat belts may be less comfortable and less likely to be used."

The research caught the attention of the Ryder transportation company, which has announced a partnership with the Women in Trucking Association to improve conditions for female drivers.

Vehicle specifications Ryder is reviewing include:

- Height and placement of cab steps and grab handles.
- Adjustable foot pedal height (accelerator, brake, clutch).
- Height of seat belts (shoulder area).
- Visibility of dash gauges.
- Electric/hydraulic hood lifting mechanism.
- Automated transmission shift lever placement/location.
- Access to the top of the dash.
- Better access to oil and coolant check and fill.

"It's important for manufacturers to take women's needs into consideration when

designing and specifying new vehicles, and we are encouraging all of our major suppliers to do so," said Scott Perry, Ryder vice president for supply management.

"In addition many of the same design changes will also support the needs of men who are smaller in stature, as well as the growing population of aged male drivers. With the current industry-wide shortage of professional drivers, this is a strategic initiative that can have far-reaching implications for truck fleets."

Ryder said it will deploy the design changes in its owned and leased fleet and will encourage vehicle manufacturers to consider additional design changes.

Kersten emphasized the important role Voie had in the study. "She came to me with this issue, and I designed the project with her for the students," Kersten said. "She was also instrumental influencing Ryder to take an active approach regarding the results."

UW-Stout graduate students who worked on the project included Matt Mauer of Chippewa Falls, Jane Palakeel of India and William Chacon of Venezuela.

At Marten Transport . . .

One of the cornerstone philosophies at Marten Transport, Ltd. involves providing employees with quality, up-to-date and safe equipment. We believe that our drivers deserve every advantage and we work hard to make sure they have the best possible tools to do their job. Our equipment is constantly updated and meticulously maintained. We utilize the latest temperature control technology and observe regular trade cycles.

We view safety as a priority — and our track record proves it. We've been named Grand Prize Winner for Fleet Safety by the Truckload Carriers Association twice ('02 and '04) in the past four years and placed among the top three in the contest seven of the last eight years.

The Georgia Motor Trucking Association awarded us their Grand Champion Safety Award honors for General Commodities Truckload Division in 2002 and 2004. We also earned top safety distinction from the Wisconsin Motor Carriers Association in 2004.

In addition to our Safety Department, we have a Safety Committee in place. This committee has representation from the Safety Department, Risk Management, Maintenance Department, and a person from each of the outlying Marten terminals. It is a ten member committee that elects a Chairman, Co-Chairman and Secretary yearly, with the Safety Manager as the advisor.

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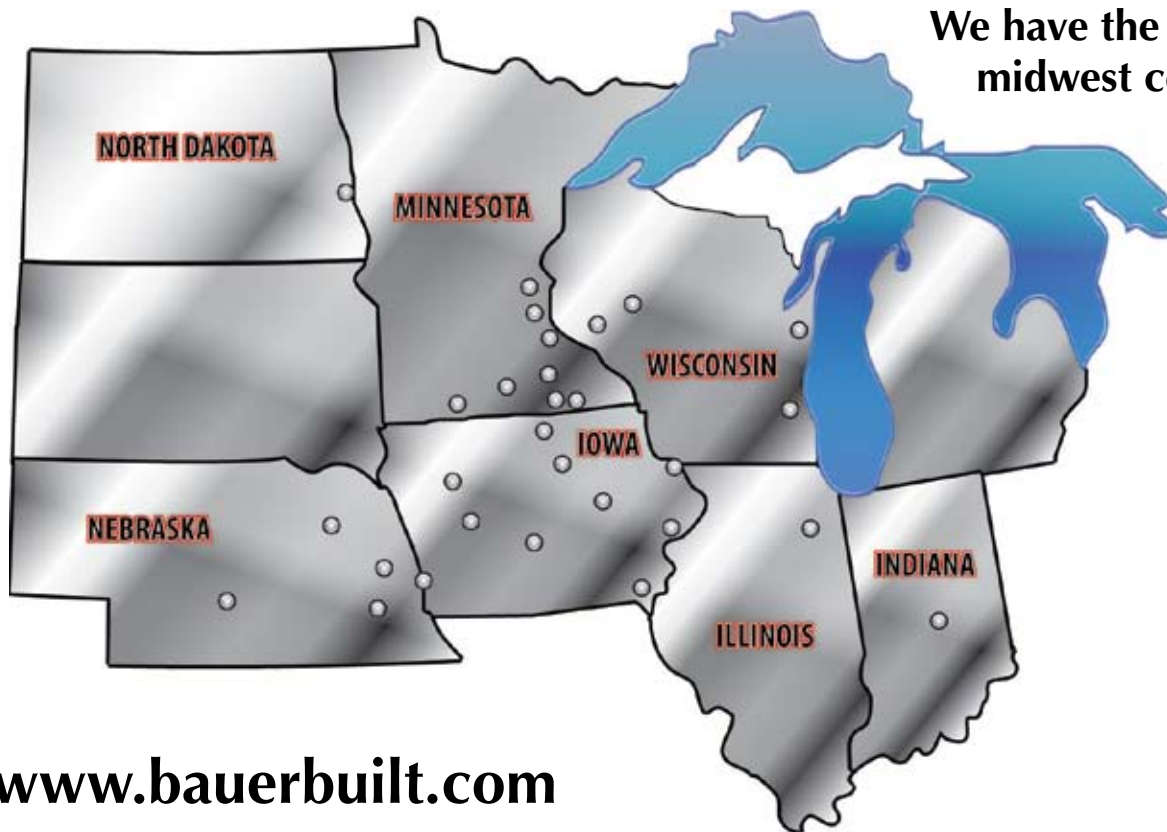
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