



Fort Wayne

ENGINEERS' Club

www.FortWayneEngineersClub.org

Engineers News

March 2015 - Vol. LXXVII No. 7

March Tour

80/20 Inc.

Tuesday, March 10th at 7:00 PM
1701 County Road 400 East, Columbia City, IN 46725

FWEC President Marna Renteria has arranged a tour of 80/20 (<http://www.8020.net>) for the club. Please RVSP to Treasurer Ryan Stark at info@fortwayneengineersclub.org. Upon reservation you will be sent a copy of the 80/20 Visitor Safety Guidelines and the Visitor's Non-Disclosure and Waiver Agreement. Please bring a signed copy of this agreement to the tour to help speed things along at our start.

80/20 is a T-slot aluminum system you use to build virtually anything. When you think of 80/20, think of an industrial "erector set". You mix, match, assemble and reassemble our products to create your customized solution or innovation. We have been in business for over 25 years operating on a campus of over 300,000 square feet. 80/20 Inc. has both a national and international presence with customers in practically every industry. Anybody can use our product; from machine frames, robots, desks, material handling racks, 3D printers, trade show exhibits and beyond, there are no limitations on what you can create. 80/20 provides modular solutions to advance ideas and implement designs. 80/20 Inc. is located at 1701 South 400 East, Columbia City, IN.

April Tour

What: See a homebuilt aircraft kit in progress
Where: Jim Stark's house - East of Ossian and South of Poe
When: Thursday April 30th starting at 7:00 PM

Jim Stark (father of current FWEC Treasurer Ryan Stark) is building a kit plane in his garage. The plane is an RV-12; a two-seat, low wing all aluminum aircraft made by Van's Aircraft Company. This aircraft kit can be purchased in parts and Jim is on the third part. The first was the tail and empennage, and second kit was for the wings, and the third is for the fuselage. Pizza, chips, beer, and pop will be provided and there will also be a bonfire going in case it gets cold.

See this link for more info: <https://www.vansaircraft.com/public/rv12.htm>

Northeast Indiana DiscoverE Engineers' Week Banquet

The Northeast Indiana DiscoverE Committee hosted their annual Engineers. Week banquet on Saturday February 28th at Indiana Tech. The banquet presented academic awards to local engineering students. Academic awards were donated by the FWEC and other local societies and engineering companies. Award recipients and donors are listed below.

- Zachary Brunner, IPFW Mechanical Engineering, Parker Hannifin Corporation
- Ryan Cavender, Indiana Tech Biomedical Engineering, Oscar Weitzman Memorial
- Carter Delaney, University of Cincinnati Mechanical Engineering, Steel Dynamics
- Andrew Eckrich, University of Dayton Mechanical Engineering, American Society for Quality
- Chat Gamba, IPFW Electrical Engineering, Duane Avery Memorial
- Cassandra Gatton, IPFW Mechanical Engineering, Superior Aluminum Alloys
- Lane Harrison, IPFW Mechanical Engineering, John Stump Memorial
- Marie Langford, IPFW Electrical Engineering, BAE Systems
- Andrew Leichty, Trine University Mechanical Engineering, BAE Systems
- Laura Loreda e Silva, IPFW Civil Engineering, Fort Wayne Engineers. Club
- Cullan Magnuson, IPFW Mechanical Engineering Technology, Association for Facilities Engineering
- Andrew Magsam, IPFW Civil Engineering, Fort Wayne Engineers. Club
- Tiffany Temple, IPFW Mechanical Engineering, BAE Systems
- Andrew Whiteman, IPFW Electrical Engineering and Computer Engineering, Raytheon Network Centric Systems

The banquet also presented the Citizen Engineer award. Elizabeth Garr was awarded the Northeast Indiana Citizen Engineer Award for 2015. Elizabeth is a past president of the Fort Wayne Engineers' Club and currently serves as Secretary. She has been very active in the Fort Wayne community supporting causes including Junior Achievement, Toys for Tots, the American Cancer Society - Making Strides Against Breast Cancer, American Red Cross, Fort Wayne Philharmonic, and a longtime member of the Cinema Center and Arts United.

Elizabeth graduated from Angola High School, then acquired a BSME from Tri-State University in 2004. She is an ASQ certified Six Sigma Greenbelt and worked six years as a Project Engineer for Navistar. She has been with Parker Hannifin, Precision Cooling Systems, in New Haven for four years. Elizabeth is currently Parker Hannifin's Engineering Services Supervisor.

Elizabeth thanked her family for always being there for her (her father was in attendance) and thanked the Engineers' Club for nominating her (noting one gets all kinds of surprises when you miss Board meetings). She made a point that engineers must have personal integrity and how important that is in our lives and particularly in our jobs, but personal integrity cannot be maintained without the support of others in one's private life. Maintaining honesty and integrity to always do what is right and good and to hold fast to the Order of the Engineer, very similar to the doctor's Hippocratic Oath ([see Order of the Engineer - Wikipedia, the free encyclopedia](#)).

Please join us in congratulating Elizabeth as a recognized engineer who is technically crafted but also compassionate and giving of her time and talents.

TekVenture Open House

Friday, March 13th at 5:00 to 8:00 PM
1800 Broadway, Fort Wayne, IN 46802

(Tours include dirty work areas - close-toed shoes encouraged)

Exterior work on the building was completed late fall resulting from a City of Fort Wayne 2014 Commercial Faade Grant. Throughout that process TekVenture Makers and Volunteers have been working to clean out the building while bringing the former retail space to code. After months of hard and dirty work, we are excited to begin operation in the new location while building out additional phases of our

project.

The TekVenture Rapid Prototyping Center is dedicated to providing tools for designing and fabricating models of all sorts. It offers digital tools for design; imaging; audio/visual media; CAD/CAM; 2D and 3D scanning and printing; vacuum-forming; laser engraving and cutting; sewing, and digital drawing.

Much like a gym, TekVenture is a member-based organization offering access to a huge variety of tools and materials. As importantly, TekVenture is a place where people go for fellowship with other like-minded creative people whether making art, technology or other projects or prototypes. 24/7 access to Maker Members is our goal.

The general public also has access via unique hands-on workshops, demonstrations, community building projects and events.

Now that Phase I will soon open, attention will turn to securing specific tools while building out additional labs such as the TekVenture Robot Factory, Hot Shop, Machining Center, Woodworking Shop and TekGarage (including a hydraulic car lift.)

Welcome new FWEC Member

The FWEC would like to welcome new full member Casey Landis, Manufacturing Engineer. Remember, the FWEC is the best deal in town with monthly tours at \$10 per membership year. Please be sure to recommend FWEC membership to your colleagues and friends.



Fluid Power, Safety and Automation Specialists

Jake Dinius Sales Engineer (260) 797-9819 Cell
jdinius@sidenereng.com (260) 423-2595 Office



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2014-2015 FWEC Board Members

Below are the 2014-2015 FWEC board members. Board positions are crucial to the planning of tours and events for the FWEC. Please consult the FWEC constitution (<http://fortwayneengineersclub.org/constitution.pdf>) or contact us at info@fortwayneengineersclub.org for information on specific duties on board positions.

Current 2014-2015 Membership Year Board

President: Marna Renteria Vice President: Rod Vargo
Treasurer: Ryan Stark Secretary: Elizabeth Garr
1st Year Board Member: Mike Magsam & Jack Philipot
2nd Year Board Member: John Magsam & Rob Cisz
3rd Year Board Members: Dan Delaney & David Momoh

FWEC Membership

The FWEC exists through funding of its membership. Please forward your copy of the Engineers. News to prospective members and encourage their attendance at tours. Remember, the FWEC is the best deal in town with monthly tours at \$10 per membership year. Please be sure to recommend FWEC membership to your colleagues and friends.

Advertise in the Engineers. News

New for the 2014-2015 membership year! The FWEC will be selling advertising space within the Engineers. News. Advertisements are \$10 per issue and limited to page of content. For submissions please contact info@fortwayneengineersclub.org.

IPFW Opportunity Banquet



The 12th annual Opportunity Banquet hosted by the IPFW SWE chapter (<http://www.engr.ipfw.edu/~swe/index.php>) will be held on Friday March 27th, 2015 from 4:30 to 9:30 PM. The Banquet will be held on the IPFW campus in the International Ballroom WU 149 and 150 (<https://www.ipfw.edu/dotAsset/734e1ea9-dc15-49b5-9c43-15e30c0f2639.png>). The banquet will have a career fair and networking dinner. The dinner will feature guest speaker former Astronaut Captain Robert .Hoot. Gibson. Advance tickets are required and are \$30 per person. Tickets must be purchased by March 20th. Please contact Elizabeth Thompson at thompsoe@ipfw.edu for tickets and further information.

February Tour History

The February tour history is provided by FWEC Vice President Rod Vargo.

Freedom Firearms treated 16 FWEC members on February 19th to a generous tour arranged on short notice. Keith Wallace, an off-duty Fort Wayne Police officer and National Guard (formerly Regular Army) instructor, took us on quite an exploration. The atmosphere at Freedom Firearms seemed comfortable across age and gender, intending to avoid seeming intimidating or cliquish. The store was worth the visit just for looking, conversation, and historic pieces. Seemingly affordable lessons are offered explicitly for any level of knowledge, and hopefully before acquiring anything for home use. They may try introducing a different firearm each Wednesday night for \$20 per night, shooting not required.

Keith covered far too much ground to report properly. The propellant, or "gunpowder" historically speaking, has finely controlled shapes and sizes to produce an absolutely consistent burn rate and power. Pistol ammunition burns so fast (to expend itself within the time allowed by short barrels) that it has a strong probability of exploding the weapon if used as rifle ammunition.

Recoil begins immediately. Books and media usually claim that forces within the barrel are "opposite and equal" until it becomes unplugged. The clear experience in our host firmly settled the question. (The answer impacts how artillery, tanks, and snipers absorb recoil while returning the barrel to precisely the same aim for the next firing.)

Brass cartridge casings still provide the most uniform and effective expansion (due to "exploding" propellant) to seal the breech while still reliably ejecting after use. A consistent weight and length of individual casings is almost as important as consistent propellant in producing tight groupings of bullets in targets. A consistent geometrical seating of the primer in the casing is required for a consistent wave front of fire from the primer. Precise linear alignment of everything is key from the firing pin through the primer to the expansion of the casing through the powder burn to the projectile movement against the linear alignment of the shooter's skeleton.

Some projectiles had hollow tips or, alternatively, copper jackets might not include the tip of the projectile. These hollow point bullets expand in the target, transferring energy into the target instead of using that same energy to continue out the back of the target. When hitting wallboard in homes, the expansion eats up energy and results in a larger, much slower, bullet which often cannot pass through the second wallboard. This may significantly protect family members, but is horrendous if hit by direct fire.

Concrete blocks (such as basement walls) appeared to resist a first shot. In fact, the first round spalls (shatters) pieces off the hidden inner side of the block. One or two more shots cause disintegration. Spalling from the far side of concrete or metal plate is often lethal. A bullet hitting the ground or a solid wall will tend to continue skipping or ricocheting alongside it, so hiding close to them may increase your risk.

Even the least powerful 22 caliber guns (= 0.22 inch diameter bore in the barrel) are very deadly. The small, typically slow, projectiles tunnel (deflecting more than penetrating) around the body before stopping, splitting off pieces and moving sepsis in ways that physicians cannot easily track. Treatment and death are often processes of waiting for infections or bleeding to pop up for weeks.

A small 22LR projectile from a pistol appeared erratic in path while penetrating gallon jugs of water, ending up inside the third jug. A high velocity 22 rifle round blew through five jugs and kept going with some upward deflection. Muzzle velocities were probably 1080 feet per second (subsonic) versus 2800 fps (mid Mach 2). The projectiles weighed nearly the same, so the force was (1080 fps squared) versus (2800 fps squared), a seven-fold difference. (The 22LR has been by far the

sales leader in civilian cartridges worldwide for a century.)

Pistols and shotguns tend to be accurate only at relatively short ranges, allowing use of subsonic muzzle velocities (<1150 fps here). Subsonic is much quieter and design of projectiles easier. But, subsonic muzzle velocities tend to require heavier projectiles to offset the low velocity, plus fasterburning powder. The ammo and sturdier weapon load the shooter's body with a lot more recoil and overall weight.

Revolvers allow a wider range of ammunition choices. A 38 Special round versus a 357 Magnum were tested from a classic detective-style 38 caliber revolver against construction block, and 45 jacketed hollow point versus solid jacketed rounds from a semi-automatic pistol. The Special left a surprisingly neat hole with a 3 inch diameter cone of missing spall behind it. The Magnum disintegrated the first wall of the block and shattered out the second wall, shedding its copper jacket and leaving the lead bullet heat-fused with concrete. The Special was perhaps the limit of most folks' tolerances for recoil (wrist injury). The Magnum's concussion bordered on invasive (mental shock).

While not obvious at first, the 45's revealed military intelligence. The jacketed hollow point (1140 fps) left an unimpressive and shallow 1 inch diameter spall on the shooter's side of the block, unique to this case. The solid jacketed round (850 fps) left an unimpressive broad visible fracture (somewhat unique) on the shooter's side and a 2-3 inch spall on the inside. Both rounds had delivered a uniquely thumping hitting blunt trauma. Recoil and noise were somewhat more than the 38 Special, but the 45 semi-auto was intended for military officers until replaced by the 9 mm. A typical 9 mm semiautomatic pistol round calculates to 35 caliber and tested accordingly.

An old Kevlar vest stopped the 45's but still transmitted lethal blunt force through to the torso (wet newspapers in a bag). An optional hard plate spreads the blunt force over a larger area well enough for "only" extensive bruising. Vests can be even more important during car accidents as noted by our instructor who survived a severe side impact collision in his squad car that would likely have been fatal without the vest.

Various 12 Gauge shotgun rounds were decidedly inferior for most situations except hunting.

Most pistols and rifles have "rifling" grooves cut helically down the length of the barrel's bore. This causes the projectile to spin like a gyroscope, providing vastly more directional consistency until the spin wanes.

Lighter weapons and ammo have been increasingly required since World War I, forcing much more intense engineering, quality control, and training. Lighter ammunition uses smaller projectiles pushed by relatively huge amounts of propellant to extremely high velocities. Even a small 223 (0.223 inch) round from an AK assault rifle caused significant blast damage within layers of wet newspaper (3200 fps, probably hollow point) but was relatively well contained within the target. Pushing a bullet well into Mach 2-3 AND imparting a spin in as little as 24 inches can cause the barrel to progressively flip and slap from torsional forces, so modern rifling may progressively increase from entry to exit. Muzzle brakes are often threaded onto the end of barrels to provide jets of escaping propellant that counteract recoil. Unintended consequences of the jets can range from annoying to harmful for people in their path, including the shooter. Muzzle fittings can serve other functions including strengthening the muzzle, hiding the muzzle flame, and suppressing noise.

The shape of supersonic projectiles is complex engineering. The back fifth to third of supersonic projectiles now tend to be "boat tailed": tapered around the aft perimeter to reduce drag, but still retaining some flat or concave rear surface to maximize

force from the propellant. (This more than doubled range of artillery pieces.) Upon leaving the muzzle, the projectile must pass through a supersonic shock wave which can cause it to tumble or even fly back end forward.

A projectile fired horizontally will fall downward at the same rate as if dropped by hand (in a vacuum). On level ground, how far a projectile travels before grounding is a matter of velocity. The maximum velocity occurs when a projectile leaves the muzzle and deteriorates from there. Each design of projectile has a ballistic coefficient and other data describing its hypothetical standard trajectory. Additionally, humidity acts as a lubricant and decreases atmospheric density (resistance and drag). Altitude and temperature also affect air density. Shooting into or from a valley progressively changes density as well as adds or subtracts the pull of gravity. East-west rotation of the earth can create enough movement to miss a target at 1000 yards (0.57 mile). Coriolis Effect can induce errors when shooting north-south. Spin drift from rifling is typically 8 inches at 1000 yards, either right or left depending on direction of spin. Wind causes drift, so snipers must read various air movements between them and a target.

BUT, there is an App for all that! Smartphones or PDAs can do most of the above math and measurements including temperature, humidity, pressure density, compass direction, GPS position, and wind speed. Potentially, a laser could read wind effects to the target. A week with a PDA can now offset 40 years of full time experience. Sniping and competition have extended beyond 1000 yards to 2000 yards using enhanced 30 caliber magnum and traditional 50 caliber cartridges.

We concluded with a 308 Winchester Tactical Sniper round fired through a sharpshooting rifle (24 inch barrel, 2850 fps) into a good-sized ham (courtesy of Freedom Firearms). Nearly half exploded into pulled pork. Muzzle velocity was similar to the 22 caliber rifle that we started with. Projectile weights were 9.72 grams versus 2.6. (The 308 Winchester standard round is second in worldwide civilian sales after the 22LR, both being somewhat unique in hunting and target adaptability, versus cost.)

Our host's response to the American Sniper movie resembled Chuck Yeager's view of The Right Stuff. Hollywood entertainment leaves out a lot, particularly the hard slow work. And, snipers do not shoot over hills (yet?). Our most sincere THANK YOU to Freedom Firearms!

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FWEC Board Meetings

Fort Wayne Engineers. Club board meetings are open to all FWEC members. The next FWEC board meeting will be Tuesday April 2nd at 7:00 PM. Board meetings are held on the Indiana Tech campus in the Academic Center in room ACC-201 (<http://www.indianatech.edu/wp-content/uploads/map-color-large.png>). Note the new location, our meetings have moved from the Zollner building to the new Academic Center.

Engineers' News Past

The FWEC has a significant history; Treasurer Ryan Stark and his wife were able to find past Engineers News documents dating back to 1938! Here is an excerpt of the past newsletter (a scanned copy of the entire newsletter is available through the FWEC website):

[Engineers' News from March 15th, 1944](#)

POST-WAR DREAMS

The commercial advertisements are playing up to the public numerous fantastic product designs for post-war consumption, such as ultra-modern streamlined automobiles with transparent plastic tops – tear-drop design trucks – transparent refrigerators of cylindrical shape having revolving trays – speed boats with flourishing lines and millionaire appointments – and even the flat iron has been streamlined for speed.

The public's conception of the words "Post-War" is more than a vision. In fact, too many believe that it is now an actuality and expect to see almost an overnight production of these fantastic products – sort of a modern industrial revolution – when the war is over.

The public has been told of the marvels of engineering and industrial accomplishments in the conversion from commercial to military enterprise and fully expect like marvels in the re-conversion. What a time the engineering profession is going to have in trying to explain that the pretty pictures are not the practical thoughts of engineers and manufacturers, but just the opium dream of stylists.

There is no doubt that the future holds in store many improvements in the luxuries of life and they will be available in Post-War period – but, let's not forget that the automobile, electric lights, the telephone, electric refrigerators, etc., were Post-War products – Post Civil War.

The Post-War Era will last until the next war.

12th Annual
**OPPORTUNITY
BANQUET**

March 27, 2015 4:30-9:30pm

International Ballroom, WU 149 & 150

With Special Guest Speaker Former Astronaut
Captain Robert "Hoot" Gibson "Lessons
of Aviation, Space, & the Cold War"

Ticket sales open to the general public Feb. 4—Mar. 20, 2015. Make checks (\$30) payable to the Society of Women Engineers and mail to Elizabeth A. Thompson, Ph.D.

IPFW

Department of Engineering, ET 321J

2101 E. Coliseum Blvd.

Fort Wayne, IN 46805-1499

Include your dinner selection: Beef Brisket, Breast of Chicken Rosemary, or Grilled Vegetable Kebob

Also include your title (e.g., IEEE member).

Ticket price includes career fair, networking dinner, speaker, and engineering trivia game with awarding of door prizes.

ATTIRE: Business Formal

Questions? Contact Dr. Thompson at (260) 481-6361

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