United States Public Health Service

MACHINATORES VITAE

Engineer Community Newsletter

From the Chief Engineer Officer

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Stay in Touch with the "Why" In What We Do

I recently attended a dinner with General Officers and Senior Executive Service members; as the conversation at the dinner table went on, there was surprise that there are engineers in the United States Public Health Service (PHS). I immediately talked about how and why PHS engineers at the Indian Health Service (which was also not well known for having PHS officers) were assisting with its mission to improve the health of American Indians and Alaska Natives. As I described our broader mission within the Department of Health and Human Services and why the Commissioned Corps is utilized, I transitioned to what engineers do in the Food and Drug Administration, the National Institutes of Health, the Centers for Disease Control and Prevention, etc. As I write this, it occurs to me that we need Ambassadors, not only for public health, but for *engineering* as well, to carry us forward. I am asking you to be that Ambassador for Public Health Engineering. I mean, in the broadest sense, for each of you to learn what your peers and colleagues do in such a way that you can hold a conversation with anyone who will listen about what we do and be able to direct them to where they can learn more.

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Also, there is a new publication called "Health21" that provides an opportunity for us to write about how engineers are promoting and advancing the health and safety of the nation. This publication is connected to the Society of Federal Health Professionals (AMSUS). Check out the site at http://health21initiative.org/.

Let's stay in touch with the "Why" in what we do.

RADM Randall J.F. Gardner, P.E.

If you have any questions or comments related to the Engineering Category or EPAC activities, feel free to contact any of the following EPAC members.

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Do Not Fall in the Manhole

CDR Kurt Kesteloot, MSE, MPH, PE, BCEE
2017 EPAC CHAIR

CDR Kesteloot inspecting a manhole

I hope you are having a great 2017 and will continue to share any questions regarding the United States Public Health Service (PHS) and engineering. Do not fall in the manhole, you are not alone. There are almost 400 engineer officers in the PHS. If you do not know at least 10 engineers, or feel like you are alone, please contact your EPAC voting member for your agency or myself. Many of us have experienced the sense of being on our own, sometimes even in D.C. or other metropolitan areas. Work is always a competing priority that makes it hard to connect with our fellow engineers. We are striving to involve all EPAC voting members to communicate with all PHS engineers and our colleagues in the civil service. The subcommittees continue to do great work and there is always more we could do. With that said, I appreciate everyone that has and continues to volunteer to assist EPAC and other engineers. We have a one more EPAC meeting in 2017. My main objective is to keep everyone informed, continue to ask about ways for us to fund raise and support EPAC events, etc., and help make sure everyone understands and competes for awards and other forms of recognition that raise awareness of our engineering contributions.

As you may have heard, the EPAC Career Development Subcommittee has been working on a CV template to assist promotion board members in efficiently and effectively scoring officers for promotion. EPAC will vote on the recommended format before it is posted and implemented in 2018 at the earliest. Please visit our website (https://dcp.psc.gov/osg/engineer/) for other helpful resources (including the recently updated Public Health Infrastructure Assessment Guide) and check out the Announcements from the Office of Chief Engineer emails for the latest news impacting engineer officers.

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It has been an honor to serve as the EPAC 2017 Chair. I look forward to assisting CAPT Harvey in 2018 along with CDR Sam Russell (2019 EPAC Chair-elect). Both are excellent officers and will do amazing work for EPAC. However, they will need your help. If you want to help or socialize with other engineers once a month, please consider getting involved with EPAC subcommittees. Remember to stay out of the manhole and remove your cover if you think you are going under. Work consumes many of us and EPAC provides many opportunities to help, make a difference, and meet many of your fellow engineers. Machinatores Vitae!

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Giving Back To Your University

CDR Kris Neset

CDR Kris Neset, LCDR Travis Spaeth, and LT Chris Peltier (from l to r) have been involved in recruiting for IHS/USPHS at NDSU and UND over the past several years.

Many new engineers had the experience where six months after graduation you receive a call from your alma mater where they want to "make sure their records are up-to-date." It doesn't take long to figure out their main reason for calling is to receive a donation to the university's foundation. I think these calls are ironic since many graduates have a net worth of <$0 due to student loans. My experience with that 6-month call: I politely declined as there were other financial priorities such as a recent home down payment and marriage within the past year.

My wife and I have always tried to give back to areas and organizations that are important to us. This doesn't have to be in the form of monetary donations. In fact, the giving of

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time and talents is more important than monetary gifts. It's been proven to improve mental health, as helping someone or volunteering takes the focus off yourself. This could be something as simple as mowing an elderly person's yard.

Giving back to North Dakota State University (NDSU), where I received my engineering education, has been a series of non-monetary contributions over the years. This past spring, I had the opportunity to present to the Intro to Environmental Engineering class. I covered water, sewer, and solid waste; the wheelhouse for Sanitation Facilities Construction (SFC) engineers that work for the Indian Health Service (IHS). I was able to promote the specific office I work in (Minot District Office) by highlighting our projects from start to finish. On a larger scale, I was able to highlight the IHS as well as the PHS. Other agencies highlighted were the Environmental Protection Agency (EPA), the U.S. Bureau of Reclamation, U.S. Department of Agriculture-Rural Development (as we joint-fund projects with these agencies). My current position as a Tribal Utility Consultant (TUC) allows me to work with EPA Region 8 (based in Denver, CO) so I was able to explain to students the unique role the TUC has with the EPA and Tribes to promote and advance public health on tribal lands. The students had plenty of questions during the formal Q&A in class and afterwards. The questions ranged from regulations, construction, careers with IHS and USPHS, and my personal experiences. Being able to share lessons learned and "boots on the ground experience" is extremely valuable to students and professors that are hungry for real world applications and experiences to compliment theory-based learning.

Another way I have given back to NDSU was assisting with the 2013 Senior Civil Engineering Capstone project that was based on a large sewer project (St. Michael Lagoon Relocation) for which I was the design engineer and project manager. The project was actually constructed in 2014 and 2015, so the timing of the Capstone class was perfect as we were in the design phase at that time. It was rewarding to see how the Civil Engineering Department Chair took a real world project and applied it to a classroom setting. If you ever have the opportunity to become involved in a Senior Capstone project with a local university or your alma mater I would highly recommend it.

I have also been able to participate for several years in the NDSU Engineering Expo in Fargo, ND and the University of North Dakota (UND) Career Fair in Grand Forks, ND. We are able to promote the PHS as well as IHS. Recruiting is a great way to stay involved with your local university or alma mater. The benefits go both ways as you have opportunities to network with other agencies and consulting firms. The Great Plains Area IHS always teams up with the Bemidji Area IHS when recruiting, so we meet other IHS engineers. The professors (specifically at NDSU) go out of their way to tell students to stop by the PHS/IHS

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booth. A couple of the professors at NDSU are involved in distance learning for the pre-engineering programs at the Tribal community colleges in North Dakota so you can see how things come full circle.

Much of what I have described is done outside of "normal work day duties" so extra effort is needed. However, I know you will be glad to have given back to your alma mater or local university – it has been a rewarding experience for myself!

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2017 AWWA Annual Conference and Exposition

CAPT Nelson Mix

CAPT Mix receiving his "AWWA Distribution Plant Operation Division Best Paper Award"

CAPT Nelson Mix, PE, CHMM was the only PHS officer who recently attended the American Water Works Association (AWWA) 2017 Annual Conference and Exposition in Philadelphia, PA, which was attended by over 11,000 people. He delivered two presentations: (1) *Advanced Metering Infrastructure Pilot Study: Backflow, Resilience and Tampering* and (2) *Designing Communication Systems for Water Quality Surveillance and Response Systems*, and presented two posters: (1) *Leveraging Customer Complaints for Water Quality Surveillance* and (2) *Security Equipment: Recent Trends and the Near Future*. Additionally, CAPT Mix and Mr. Kenneth A. Thompson (Deputy Director of Intelligent Water Solutions at CH2M) received the "AWWA Distribution and Plant Operation Division Best Paper Award." They received this award for their peer reviewed article: *Improving Water System Resiliency and Security: Advanced Meter Infrastructure*, which was published in the *Journal of the American Water Works Association* in June 2016. The paper discusses the application of advanced meter infrastructure for detecting tampering and backflow incidents. This is broadly relevant to PHS engineers involved in the design, construction, regulation, or assessment of public drinking water systems. An abstract of this article is available at http://www.awwa.org/publications/journal-awwa/abstract/articleid/56659734.aspx.

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Firearm Suppressor as a Noise Control—My JRCOSTEP Experience

ENS Adam Campbell

Figure 1. Calibrating one of the 122 microphones for the Quantico Noise Survey. Dr. Kent Gee (Brigham Young University) is discussing the positioning of the beam-forming array to identify noise sources on the M-16 rifle. I am performing a calibration of the 1/8-inch microphone for the NIOSH impulse noise data collection system.

As a college student in 2016 and 2017, I was honored to be chosen to participate in the Junior Commissioned Officer Student Training and Extern Program (JRCOSTEP) program with the Hearing Loss Prevention Team within the Division of Applied Research and Technology within the National Institute for Occupational and Safety Health (NIOSH), Centers for Disease Control and Prevention (CDC). The program provided me an incredible opportunity to interact with and learn from leading members of their respective fields on a daily basis.

This was an exciting opportunity to apply many of the abstract concepts from my college coursework as useful tools of data analysis. The focus of my 2017 internship was on answering a simple question, "Are firearm suppressors a sufficient engineering noise control for protecting hearing health?" Working closely with CAPT William Murphy (Scientist officer at NIOSH), I learned a lot about acoustics, the properties of sound, and the process of analyzing the data necessary to answer my internship objective. In short, we did see a sufficient attenuation of sound levels that would bring the total below the threshold of 140 decibels sound pressure level (dB SPL); however, this was only in cases with low velocity ammunition and smaller calibers. For ammunition with muzzle velocities that exceed the speed of sound (340 m/s), we found suppressors did not necessarily reduce the exposure at the ear to lev-

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els below 140 dB SPL. A unique characteristic of high velocity ammunition is that it is difficult to provide much, if any, attenuation in the higher frequencies due to the presence of an N-shaped ballistic shock wave or N-Wave. One aspect my work involved looking at the frequencies where there was a significant attenuation due to suppression, Figure 2 shows the effects of suppression as a function of frequency.

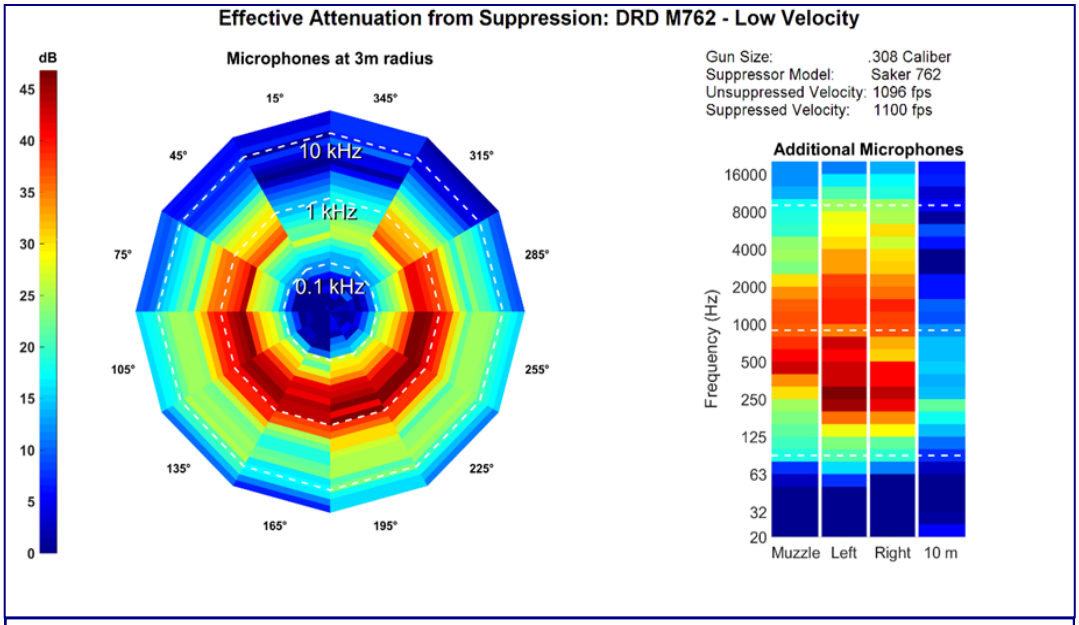

Figure 2. Effective Attenuation of the Saker762 suppressor as a function of frequency measured with 16 microphone array. Twelve microphones were positioned at 3 meters with 30 degree spacing from the muzzle of the DRD M762 rifle (.308 caliber). Microphones were positioned 1 meter to the left of the muzzle, 15 centimeters from the right and left ears and 10 meters downrange at 15 degrees. The frequency spectra were calculated for the unsuppressed and suppressed conditions and subtracted to determine the effective suppression as a function of position and frequency.

As a 2016 JRCOSTEP, I worked with CAPT Chuck Kardous (Engineer officer at NIOSH) to provide the voiceover for an instructional video for an app that was being released by NIOSH. In 2017, I was asked to be an "actor" for another video that showed the app in a realistic environment that was meant to demonstrate its capabilities. After initiating my acting career, I also participated in a field exercise with CAPT Murphy and CAPT Kardous in Quantico, Virginia. I helped to collect impulse noise measurements from an outdoor firing range that will be used to characterize the sound propagation and to better protect the hearing of recruits and drill instructors. This effort was a collaboration between the U.S. Air Force Research Laboratory (Battlespace Acoustics Branch) the Office of Naval Research (Warfighter Performance Department, Noise Induced Hearing

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Loss Research & Development Program); Marine Corps Base Quantico; U.S. Public Health Service (CDC/NIOSH), and Brigham Young University. I had opportunity to interface with the researchers, program managers and Marine Corps personnel. I learned about data collection, calibration, and assembling a massive number of microphones!

As a summer intern, it is a great feeling to see the results of my efforts being put to use. The whole point of computer engineering is to make people's lives easier, to reduce the number of repetitious tasks required, and to provide access to information in a better way than was previously possible. The work done this summer is going to be part of a published document as well as several presentations. It is very encouraging to see things I worked on become part of something bigger.

Disclaimer: The findings and conclusions in this article are those of the author(s) and do not necessarily represent the views of the National Institute for Occupational Safety and Health. Mention of any company or product does not constitute endorsement by NIOSH.

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Responding to Hurricanes Harvey and Irma

CDR Joshua Simms

As Hurricane Harvey made landfall on August 25, 2017, PHS Rapid Deployment Force 5 (RDF-5) was mobilized to provide medical support to the State of Texas. Team members departed from their respective locations and staged in Dallas to await a mission assignment. We used this time to hold training sessions, prepare to set up Federal Medical Stations (FMS) and get to know our new team members and RDF-4 colleagues who arrived with us. Although the staffing request for this deployment did not specifically call for engineers, I served as a Deputy Commander for the team and found myself responding to various engineering issues as well.

On August 31st, RDF-5 arrived at the Houston Convention Center to set up and staff an FMS. There were some unique features to this facility that we had not encountered previously. We shared one event hall with a general population shelter that included Red Cross food distribution, a retail pharmacy trailer, an entertainment area and numerous state and city resource tables. This configuration presented challenges to ensuring adequate space, security, and privacy for our patients and staff. As we addressed these concerns, we were presented

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with an additional technical challenge when the Salvation Army donated two shower trailers for staff use. Without the necessary space, security, water or wastewater disposal resources to operate this facility, we proceeded to work with the City of Houston Mayor's Office, convention center facilities personnel, and the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) security detail to identify and gain access to an area that met our specific needs.

Following our two-week deployment supporting Hurricane Harvey relief efforts, we were sent to Orlando on September 9th. The team was provided a new mission to augment state and local government efforts at shelters scattered across the State of Florida in response to Hurricane Irma. I was in charge of Task Force 3 (TF3), which was instructed to head to Fort Meyers, Florida, as soon as possible with little additional information. TF3 proceeded through tropical storms to East Lee County High School in Lehigh Acres around midnight. At the team's first muster the next morning, the Incident Response Coordination Team (IRCT) announced that our mission was to support the special needs evacuees and their caregivers. The shelter had been open since September 7th and continued to accept new evacuees throughout the day. The school was filled to capacity and hallways were packed with people and belongings with about two feet of floor space to pass between them.

East Lee County High School

Following the meeting, we requested a tour of the school to conduct a quick facility assessment as the hurricane approached. We asked a number of questions related backup power, water, wastewater and food service. The tour was led by a Department of Health (DoH) representative, who was not able to respond to many of our concerns, so we requested an additional meeting with the overall administrative group. We inquired about food and sanitation services and asked questions related to facility management, such as: How long

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can the generator support the facility with current fuel levels? Is the facility's wastewater lift station connected to the generator? Is there a contingency plan in the event of an interruption in water services? Our questions were answered as Hurricane Irma made landfall. The school lost power and the backup generator kicked on. Around midnight, the public water system started to lose pressure and the school lost water service.

By the morning of September 11th, we began to encounter serious public health concerns. Toilets clogged, trash bags piled up and there was insufficient food for the staff and evacuees. Numerous TF3 members did not eat for several meals to ensure the others had food. As time went on, the smell from backed up toilets and thousands of unwashed people began to overwhelm the facility. While I was working with the school administration to find water for drinking and flushing the toilets, the other engineer and the environmental health officers (EHOs) on our team searched the DoH supplies for personal protective equipment. They took it upon themselves to begin unclogging and cleaning the restrooms, starting in our patient areas and working toward the general population areas. Through my work with the DoH and school, we managed to get non-potable water temporarily diverted to the school from a nearby reservoir. Luckily, this was achieved shortly after the restrooms were ready to come back online. The local National Guard soon delivered bottled water for everyone as well.

On September 13th, a team from RDF-1 arrived to relieve the TF3 after three long weeks in the field. Although there were many additional challenges and storylines, I wanted to highlight just some of the technical aspects of the mission that called for the specific skillsets of PHS Engineers and EHOs, all of whom filled additional roles and responsibilities throughout the deployment. It was an honor to serve beside so many tireless responders to address the unique public health challenges brought on by these natural disasters.

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New Engineer Officers

The EPAC would like to acknowledge the following engineers who have recently become Commissioned Officers. The EPAC welcomes each of you and hope you will enjoy a long and prosperous career in the PHS.

Rank	Name	OPDIV	City	State
LT	Ka To	FDA	Silver Spring	MD
LT	Kelliann Wachrathit	FDA	Silver Spring	MD
LT	Timothy Martin	FDA	Silver Spring	MD
LT	Kevin Remley	IHS	Fort Hall	ID
LTJG	Schuyler Price	FDA	Silver Spring	MD
LT	Chaolong Qi	CDC	Cincinnati	OH

Fair Winds and Following Seas

The EPAC would also like to recognize the engineer officers who have recently retired from Commissioned Corps service. The EPAC sincerely appreciates your leadership and dedication to the mission of PHS engineers.

Rank	Name	OPDIV
CAPT	Hung Trinh	DOD TMA
CAPT	Kevin Milne	FDA

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Dear Readers,

Machinatores Vitae (Engineering for Life) is a publication of the EPAC, but we need help in bringing you the information and stories that you want to read. Please consider submitting an article for an upcoming issue or let us know when you or a colleague have reached a milestone, been recognized for an accomplishment, or have an experience to share. If you are an accomplished writer, send something along that is already polished. If you don't feel like a Hemingway or Dickinson, just send enough detail so the writing team can take hold of it and build the story for you.

The writing staff can only see a bit of the big world that is public health engineering. There are numerous accomplishments even within our readership that remain unknown except in the relatively small circles around you. If you have not presented at a national meeting, the likelihood is that no one outside of your agency, or possibly even Office, ever heard about the project that you nearly exhausted yourself completing. Here is your chance to shine!

All ideas are welcomed. Remember that we do not have to solely focus on work going on within the PHS. Let us know if you hear of new technologies or applications, or just find an interesting story from the outside world. The rule of thumb is that if you as an engineer are interested in it, then others will be too!

Send your thoughts, suggestions, or a brief synopsis of a proposed article to the newsletter coordinator, LCDR Jason Petersen at jason.petersen@ihs.gov.

Thank you,

The Newsletter Team
EPAC Information Subcommittee

Machinatores Vitae is published twice annually and posted on the USPHS Engineer Professional Advisory Committee website. The deadline for submitting articles for the **Spring 2018** edition is **February 28, 2018**.