

Marine Safety Engineering

A Note From The Director

Greetings! Welcome to the fall 2015 edition of the Marine Safety Engineering (MSE) Newsletter. First off, I welcome all of the new engineers that have reported through the summer and fall. I am happy to have you onboard and look forward to working with you in the coming months. With the holiday season approaching, many of us will be thinking of leave, parties, family traditions, and time spent with friends. This is also a season where many people make an extra effort to give their time, money, and talents to help those less fortunate through toy drives, charities, and community service. I encourage each of you to consider volunteering to help others.

In addition to some updates on the extraordinary technical work that we continue to accomplish, and a fantastic introduction to human factors engineering, we focus a portion of this edition on the activities of some of our engineers outside of work. So many of you spend time outside the office helping others, completing community service projects, and participating in extracurricular activities, which helps to create a well rounded workforce.

In his 2014 Commandant's Direction, Admiral Zukunft stated in no uncertain terms that the "well being of our people is critical to our success as a service" and that we are "dedicated to the citizens we serve." This dedication is evident in the complex and monumental projects we undertake, but even more so in our unwavering focus on the critical everyday tasks that we accomplish without fail.

In order to have a productive and resilient workforce, we must ensure that our people have a good balance in their life between family, leisure, work, and being a good citizen in their community. As you read about the accomplishments of our engineers both in and out of the office, please keep in mind the work-life balance in your own life.

I wish you all the best during this upcoming holiday season, and encourage you to take advantage of opportunities to spend time with family and friends and give back to your community. I know that we will all return in the New Year, re-energized and ready to tackle the familiar and crucial everyday business of policy letters, field support, customer service, equipment approvals, regulatory projects, and the plethora of other tasks you complete, often with little thanks. This work is vital to the continued safe and efficient functioning of our nation's maritime transportation system and I thank you for your continued efforts.



Jeff Lantz,
Director of Commercial Regulations and Standards



Transatlantic Race 2015: Over the Horizon

By LT J. J. Schock, Ocean Engineering Graduate Student

It is 0200 GMT. As Navigator, I am up evaluating the next 6 hours of weather information. A low-pressure system has intensified, contrary to the forecast, and we are now in the middle of 55-knot winds and 5-meter seas. Our speed over the ground is 11+ knots and we are surfing at speeds in the high teens! The on-watch wants to know how much longer we have in these conditions... I tell them that we will be in it for another 20 hours, at least.



A view ahead from the center cockpit of LADY B.

Sailing around the world has always been a dream of mine. I grew up in Chatham, MA looking east to watch the sun rise and wanting to head for the horizon. This past July, I was afforded the opportunity to realize a large part of my dream by sailing across the Atlantic as the Navigator on the Nautor's Swan 60 "LADY B," an entrant in the Transatlantic Race 2015.

The Transatlantic Race was first run in 1866 when three yachtsmen wagered \$30,000 each to race across the Atlantic Ocean from New York City to the Needles, UK. That first race was 3,000 nautical miles long and six men were washed overboard in a gale. The Transatlantic Race 2015 was the 30th edition of the race, this time between Newport, RI and the Lizard, UK; a distance of 2,796 nautical miles. This edition of the Transatlantic Race saw 36 yachts register to compete. Today, the safety requirements are much improved and thankfully no one was lost during this race; however, six yachts retired due to equipment failures.

Sailing across any ocean is a serious endeavor that should not be taken lightly by anyone who aspires to set out on such a voyage. The North Atlantic is known for rough seas, high winds, and generally poor weather associated with high latitudes. In order to prudently launch an expedition of this scale, you must start early, learn as much as possible, and train extensively.



LT Schock onboard LADY B as they round the Needles, UK.

Ocean Racing culture has come far from the 1800's. Safety equipment is now required, including AIS, EPIRBs, and safety harnesses. Additionally, vessel construction requirements and crew training standards are in place to guarantee the highest level of safety. To ensure all requirements are met, independent inspectors verify that each yacht meets the standards set by the International Sailing Federation and the race organizing authority. As a marine safety professional, it was impressive to see that the men and women who participate in the sport of Ocean Racing are some of the most prepared mariners that I have ever worked with.

As we sailed up the Solent and into Cowes Harbor the crew was giddy. With a salute from the Royal Yacht Squadron's cannon we logged the completion of our journey. To top it off we sailed fast, earning a first place finish in the Cruising Class!

Congratulations to the
Following Post-Graduate
Selectees for
AY 2016

**Chemical Engineering -
HAZMAT**
ENS Patrick Beringer

**Electrical Power Systems &
Controls Engineering**
ENS Boone Swanberg

Fire Protection Engineering
LT Katherine Ahrens

Marine Engineering
LT Bradley Peifer

LT Kenn Yuen

LT Keith Heine

LT Braden Rostad

LT Patrick Frain

LTJG Scott Arbeiter

LTJG Kimberly Gloré

LTJG Catherine Walker

ENS Brandon Foy

ENS Benjamin Mckeathen

Mechanical Engineering
LT Aaron Garnier

**Marine Safety Engineering
Program Manager:**
LCDR Jennifer Doherty

What is Human Factors Engineering?

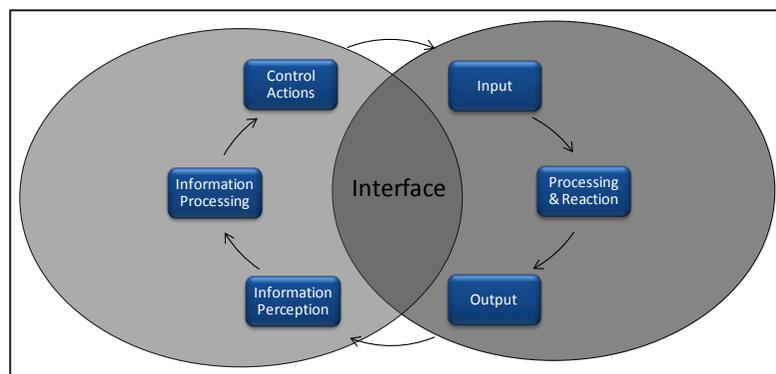
By Ms. Dawn M. Gray, CHFP, Master's Degree in Human Factors/Applied Cognitive Psychology

While there is considerable discussion in the maritime industry on addressing human error through additional training, little attention is given to designing systems that support human capabilities and mitigate their limitations. With the constant introduction of more sophisticated technologies and automated systems, it is necessary to consider the physical and mental capabilities of the mariners who operate and maintain these systems in the overall system design. This can be accomplished with Human Factors Engineering (HFE).

HFE examines the relationship between humans and the systems with which they interact. The focus of HFE is on improving efficiency, productivity, and job satisfaction, and the goal is to minimize errors and their impact. A lack of adherence to human factors principles in design is a key aspect in many incidents and accidents in the maritime industry. Therefore, it is important that naval architects and marine engineers have a basic understanding of HFE.

The six main human factors principles that can be applied to the design of marine systems are:

1. **Consistency** of arrangements, interfaces, and systems that appear in multiple places on a vessel; redundant interfaces should look and behave the same since deviations in presentation (metric vs. U.S. standard) or control (switch vs. button) increase the probability for errors.
2. **Simplicity** in the design of controls, displays, and actions required for task sequences reduces the opportunity for error and minimizes training and maintenance requirements for a vessel system.
3. **Homeostasis** refers to the human tendency to seek balance in their environment. If equipment or systems are perceived as too complex, or require more effort to operate or maintain than they believe is necessary, they will always look for a shortcut. Unfortunately, this shortcut may be perceived as being safe (e.g. overriding alarms perceived to be a nuisance), when it actually reduces the safety of the vessel.
4. **Accessibility** for visual and physical access needs to be provided in the design and arrangement of both the vessel and its equipment to allow for safe operation and maintenance during normal and emergency conditions.
5. A **closed-loop design** cycle with no delay between command input and system response best supports human performance. Any break in the feedback loop (e.g. the feedback only returns that an action was ordered) increases the risk for human error.



The closed-loop design cycle.

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What is Human Factors Engineering? (cont.)

6. **Expectations** of operators can be based on cultural, sub-cultural, stereotype, and equipment factors. The probability of error increases if the equipment or system is not designed to operate in accordance with the operator's expectations.

The principles described above are based on science and rooted in the capabilities and limitations of humans for successfully performing tasks within systems in a safe and appropriate manner. While human fallibility cannot be completely eliminated, applying human factors principles can minimize the opportunities and impacts of human error in the maritime industry.

Science, Technology, Engineering and Mathematics in the Classroom

By LT Dan Brahan, P.E., Master's Degrees in Naval Architecture/Marine Engineering and Mechanical Engineering

LT Ryan Mowbray and I had the opportunity to mentor the FIRST robotics team at George C. Marshall High School located in Falls Church, VA. FIRST (For Inspiration and Recognition of Science and Technology) is an organization which has encouraged students to pursue careers in science and technology since 1992. By providing support and technical guidance, we helped the rookie team build a working robot which competed in both regional and world competitions.

Beginning each January, FIRST challenges students to build a robot for competition, combining sport and technology. Through these challenges, FIRST replicates the process of solving a complex engineering problem. This year's game was entitled Recycle Rush. Robots, which were permitted to be up to 78 inches tall and weigh 120 pounds, scored points through a variety of means, including stacking plastic bins and trashcans while operating both autonomously and by human controller under manual control.



George C. Marshall High School FIRST Robotics Team.

Marshall's students, with the help of advisors, worked through the design process, identified ways to accomplish the goals, and chose the best design within strict parameters. The students worked in small groups, organized by subsystem. LT Mowbray and I assisted with the building and programming groups.

The team not only achieved their goal of building a working robot, but finished 7th out of 48 teams at the 2015 Greater D.C. Regional Competition, earning the Rookie All-Star award. As a result, the team qualified and competed against 606 teams at the 2015 World Championships in St. Louis, Missouri.

The FIRST robotics program presents a fantastic opportunity to mentor young students and give them experience applying engineering principles to solve problems. The students displayed a high level of enthusiasm for engineering, and several members of the team have graduated and are pursuing degrees or careers in technical fields. LT Mowbray and I intend to continue our involvement in FIRST in 2016.

MSE Attends IEC Young Professionals Workshop

By LT Andrew Gibbons, P.E.
Master's Degree in Mechanical Engineering and Naval Architecture/
Marine Engineering

LTJG Will Williams is a Master's degree candidate at the Georgia Institute of Technology, pursuing an M.S. in Electrical Engineering as part of the Marine Safety Engineering program.

Recently, he was chosen by the U.S. National Committee of the International Electrotechnical Commission (IEC) to attend the Young Professionals Workshop in Minsk, Belarus from October 12-14. LTJG Williams represented the U.S., interacting with 70 young professionals from other countries, along with two other young professional engineers as part of the 120 member U.S. delegation. All three young professional representatives were chosen based on their past accomplishments and future leadership potential "in connection with standardization and/or conformity assessment activities."

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Advocacy for Electrical Engineering Education

By LT Linsey Grainger, Bachelor's Degree in Electrical Engineering

LT Travis Thul, a reserve electrical engineer at the Marine Safety Center, received a B.S. from the Milwaukee School of Engineering in 2006 and an M.S. from the University of Wisconsin in 2008. He is a licensed Professional Engineer and plans to complete the requirements for his PhD by 2018. In addition to his job at the Federal Communication Commission (FCC), he also works as an adjunct professor at the Community College of Baltimore County (CCBC).

LT Thul was recently recognized for his volunteer work as the Engineering Technology Coordinator, responsible for developing and leading an outreach program with local defense and research institutions, including the Defense Contracts Management Agency, the National Institutes of Science & Technology, and Raytheon. This program repurposes surplus and underused equipment towards the development of CCBC's first fully complimented electrical engineering laboratory. This initiative has resulted in enough equipment to supply every student with their own oscilloscope, power supply, and function generator, as well as years worth of discrete and digital components (such as resistors, capacitors, inductors, and diodes).

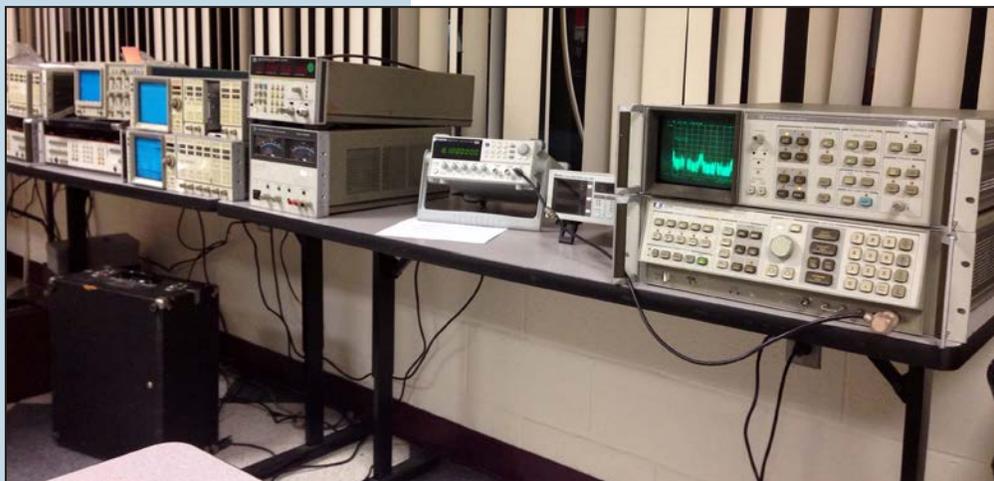
In addition to acquiring functioning instrumentation and measurement equipment, LT Thul also received some antique engineering devices intended to inspire and educate students of younger generations. These items include two U.S. Coast Guard communications radios from 1928 and 1931 (both in excellent condition). These donations, valued at more than \$3M when purchased new, will allow CCBC to offer more hands-on courses, better train tomorrow's engineers, and provide a comprehensive laboratory resource to the local community. Although there is still much work to be done, such as acquiring some of the older donated electrical equipment (including 1980s oscilloscopes), students are already benefiting from



Drawers of resistors, capacitors, inductors, and diodes which date back to the 1970s.

the opportunity to learn how to build and troubleshoot the same circuits which form a foundation of our electronics based society.

LT Thul's passion for improving the school's engineering resources is complimented by his duties teaching freshman and sophomore engineering classes and developing course curriculum. For his efforts, LT Thul was honored as the 2014 CCBC School of Applied Information Technology Adjunct Faculty Member of the Year and was chosen for the 2015 CCBC DREAM Resource & Innovation Award.



Spectrum analyzers, oscilloscopes, DC power supplies, network analyzers, power meters, and frequency counters donated to school. The equipment is from the 1980s, but works just fine!

MSE Attends IEC Young Professionals Workshop (cont.)

The workshop afforded LTJG Williams the opportunity to observe technical committee meetings for IEC TC 80 on marine navigation and communication systems – seeing firsthand the collaborative effort between industry representatives and regulators to cultivate these valuable third party standards. LTJG Williams also gained valuable insight into two standards: testing to protect against environmental conditions and explosive atmospheres. These two standards are an integral part of U.S. and international shipping regulations which incorporate by reference over 50 IEC standards.

The experience and contacts made through this workshop will serve LTJG Williams well in the future as he transitions from graduate student to Marine Safety Engineer within our community.

Petroleum Engineering & Its Value to the Coast Guard

By LT Kyle Carter, Master’s Degree in Petroleum Engineering

The offshore oil and gas industry continues to make technological advancements leading to increased system and operational complexity for exploration and production. Today’s mobile offshore drilling units (MODUs) are capable of drilling wells in excess of 40,000 feet total depth in waters up to 12,000 feet deep, all while utilizing dynamic positioning to keep station within 5 feet of a desired position. Also, offshore facilities are pushing production rates upwards of 200,000 barrels of oil per day. It is critical for the Coast Guard to retain a level of competence within its ranks to stay abreast of these advancements. Currently, I serve as a technical advisor at the Outer Continental Shelf National Center of Expertise (OCS NCOE). In addition to being a qualified MODU inspector, I earned an M.S. in Petroleum Engineering from the University of Texas at Austin, home to the nation’s top ranked program.

Petroleum Engineering consists of core discipline areas including reservoir engineering, formation evaluation, production engineering, and drilling engineering. While in graduate school, I focused studies on drilling engineering, gaining an understanding of the highly complex technical details of well design and construction, particularly those related to deepwater Gulf of Mexico. My research explored regulatory application of real-time data monitoring technologies for early identification of unsafe downhole conditions in offshore wells throughout the drilling and completions process and was published by the Society of Petroleum Engineers.



LT Carter training inspectors on well control and blowout preventers on board a MODU in the Gulf of Mexico.

As a Petroleum Engineer for the Coast Guard, I have had the opportunity to raise the level of technical competence within the Marine Safety program in areas such as drilling, well control and intervention, and production and processing. Being a Marine Safety Engineer at an NCOE has afforded me the opportunity to provide an important technical perspective not only in a staff assignment role, but also in a direct way, with positive and far-reaching impacts on personnel in the field. The addition of this specialty has captured an area of knowledge the Coast Guard previously did not possess, and it stands to greatly improve our competency in the OCS marine safety mission.



2015 IEC YP Workshop Attendees.

The Prevention program recently re-coded several billets at NCOEs, adding the OAP-16 Marine Safety Engineering specialty in recognition of the complex technical work at these units. The MSE program continues to evaluate post-graduate degrees and programs, including Petroleum Engineering, in order to remain current with field and industry needs. A tour at the OCS NCOE has provided me a unique mixture of professional opportunities, including instructing a week long course for OCS inspections, developing OCS qualification standards, and assisting with Headquarters regulatory and policy development. To maintain in-house subject matter expertise, the NCOE is dedicated to ensuring members receive additional formal education while on staff, so as to best serve the evolving offshore industry.

Cadets Experience the Value of their Technical Degree in D8 AOR – CGA's Cadet Shiprider Program

By Cadets Ben Morseth and Mason Totri, Electrical Engineering Students

Editor's Note: Marine Safety Engineering is one of several Coast Guard engineering programs that rely on the Academy as one accession source for smart, motivated engineers for our workforce. The Cadet Shiprider program was started by our MSE instructors at CGA to increase Prevention awareness among the Corps of Cadets. Thanks to the hardwork of CDR Dan Cost and CDR Josh Pennington, each year we are able to send Cadets to the industry and on internships to the Marine Safety Center to gain vital insights into how the industry operates and some of the technical challenges we are facing as regulators.

Hello, we are Ben Morseth and Mason Totri, 1/c cadets studying Electrical Engineering at CGA. Last summer we took part in an incredible opportunity known as the Cadet Shiprider Program. We saw firsthand how technologically advanced commercial vessels are utilized and how valuable our EE degrees could be in support of the Prevention mission.

We started our journey in New Orleans, where we met with representatives from Canal Barge Company (CBC). We learned about the company's operations, fleet, safety management, and the vital role shipping plays throughout inland waterways of the US. We also got the chance to meet with the District Eight Commander, RADM Callahan. It was amazing to listen to a weekend brief and realize how much is going on in the District Eight AOR.



On The LAINEY JONES with Captain John Belcher.

With shoreside briefings completed, we boarded CBC's LAINEY JONES. For the next 10 days, we rode the Mississippi, working alongside the crew maintaining the tow, conning the vessel, and maintaining onboard systems. After departing the LAINEY JONES in St. Louis, we joined up with Galliano Marine Services aboard the CAT ISLAND, one of their newest OSVs with dynamic positioning (DP) level 2 capability. Over the next 12 days, the crew took us under their wing and provided us with a glimpse of the incredible work going on in support of the oil and gas industry.

Following our time aboard CAT ISLAND, we attended a four day basic DP course sponsored by Edison Chouest Offshore. The course went into technical detail on the numerous aspects of the DP system including sensors, reference systems, and power supplies. We felt that our EE education was extremely valuable during this training!

Finally, we spent a week with marine inspectors at MSU Houma. This week brought the program full circle, as we inspected multiple types of commercial vessels. Our time onboard the vessels provided us with a deeper understanding of the impact of Coast Guard decisions on industry and the importance of doing our job to the best of our ability.

The CGA's Shiprider Program provided us a firsthand view of the relationship between the Coast Guard and the marine industry. Throughout the program, we made connections with different components of the marine community and the individuals who took the time to selflessly give us a great experience. We want to thank all who helped make this program possible; hopefully one day soon we will get the chance to become part of the Prevention community!

If you have any comments about this e-newsletter, or would like to contribute an article to an upcoming edition, please contact LCDR Jennifer Doherty:

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