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Marine Safety Engineering

A Note From The Director

Greetings and welcome to the Fall 2012 edition of the Marine Safety Engineering Newsletter!

This edition features projects at the forefront of marine safety engineering and showcases how engineers utilize their specialized skills to address the challenging work performed in support of the Coast Guard's Marine Safety mission. In the marine safety engineering world, you will find there is so much to be gained. A career in marine safety engineering offers the opportunity to advance your education, travel abroad and acquire unrivaled experience in the international maritime community and directly contribute to the development of technically complex standards and regulations. The article highlighting the efforts of cadets who interned at the Marine Safety Center is a testament of our commitment to nurture a new generation of engineers and equip them to develop solutions to address challenges we face. Whether you are starting with minimal engineering experience or seeking to enhance your current skill set and education, marine safety engineering is a sure way to take your career to the next level.

The Commercial Regulations and Standards Directorate (CG-5PS) is committed to recruiting the best and brightest military and civilian engineers. The knowledge, skills and abilities they bring to our sub-specialty ensure we can deliver top-notch technical support that is critical to achievement of Marine Safety program goals. I encourage you to be on the lookout for the post graduate kickoff message in the spring and apply for an advanced education position in Naval Architecture, Mechanical Engineering, Ocean Engineering, Electrical Power & Controls Engineering, Fire Protection Engineering or Chemical Engineering. The "Who's Who In Marine Safety Engineering" article featuring CAPT Mauger provides another example of why marine safety engineers are viewed as an investment for the Coast Guard and showcases just one example of a very successful senior officer whose diverse career had its roots in engineering. Our outreach activities and role as technical experts extends far beyond the Prevention Community. The "A Move Towards Non-Pyrotechnic Distress Signals" article written by Mr. Martin Jackson reflects the collaborative efforts of marine safety engineers and the Coast Guard Research and Development Center.

To the Marine Safety Engineers selected for promotion in PY 12, I congratulate you! I look forward to seeing your imprint throughout our community and the Coast Guard. Finally, I wish you a wonderful holiday season and continued success in the New Year.

Warm Regards,

Jeff Lantz,
Director of Commercial Regulations and Standards

SERT Onscene At The Response

by Mr. Brian Thomas, P.E., Master's Degrees in Naval Architecture and Mechanical Engineering

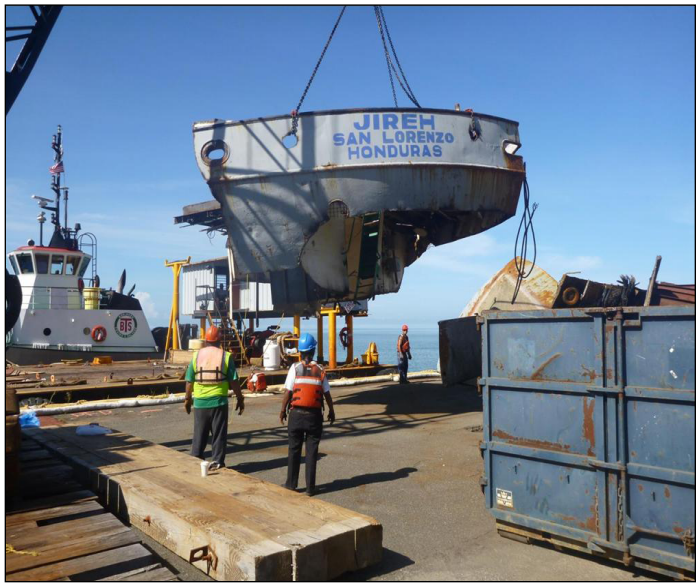
The Marine Safety Center's Salvage Engineering Response Team (SERT) is a group of highly trained naval architects who provide real-time engineering support to Coast Guard field units responding to marine casualties. During fiscal year 2012, SERT assisted 34 different field units with 60 vessel casualties. SERT's engineering capabilities were critical in two separate federalized wreck removal cases this year.

Tug TIGER at a critical moment in the refloating operation

The tug TIGER was a derelict 205' World War II era fleet tug which had sunk in a graving dock in San Francisco Bay. Previous efforts to scrap the tug had left holes in many of her watertight bulkheads. SERT's work to simulate the refloating operation revealed that the vessel would likely be unstable with a strong potential for capsizing once the hull had lifted off the bottom. To mitigate this risk, the salvor rigged a variety of lines to restrain the TIGER's tendency to heel. On the day of the operation, the simulations proved accurate and SERT worked side by side with the commercial salvor and salvage engineer to analyze the refloating evolution in real-time, maintaining control of the tug. The TIGER was refloated over the period of about 10 hours.

In the second case, on June 21, 2012, the freighter JIREH went aground on the southern shore of Isla de Mona just west of Puerto Rico. The grounding tore open the JIREH's bottom plating and flooded nearly the entire vessel to the waterline. Over the course of three months, SERT's engineers reviewed multiple wreck removal plans and went onscene to survey the wreck first hand. The data gathered at the scene allowed SERT to model the damaged vessel, evaluate the assumptions underpinning each of the removal plans, and advise the Federal On Scene Coordinator (FOSC) on the risks and likelihood of success. Ultimately, in keeping with our initial recommendations, the JIREH was cut up and scrapped in place.

SERT's LT Hinton onscene with the sunken tug TIGER



Wreck removal operations on the M/V JIREH

In both of these cases, SERT's naval architects used sophisticated engineering tools to provide practical advice to Coast Guard field units. SERT has a naval architect on call 24 hours a day, 7 days a week.

The duty officer can be reached at (202) 327-3985.

Engineer In The Spotlight

by LCDR Kevin Ferrie, Master's Degree in Naval Architecture and Marine Engineering

LT Woodman evaluating the stability of an offshore platform. Inset – Cadet 1/c Myatt

Lieutenant Lisa Woodman (formerly known as Lisa Myatt) is a naval architect who recently joined the Hull Division's Small Vessel Branch at the Marine Safety Center (MSC) in Washington, DC. She graduated from the U.S. Coast Guard Academy (CGA) in 2008 with a degree in Naval Architecture and Marine Engineering. Upon graduation, LT Woodman was assigned as a student engineer aboard USCGC HEALY, where she helped establish HEALY's shipboard waste management program, which won the 2009 Captain Niels Thomsen award for innovation in management.

Following her tour aboard HEALY, Lisa attended post-graduate school at the University of Michigan, where she earned master's degrees in both Naval Architecture and Marine Engineering, and Industrial and Operations Engineering. While pursuing her advanced education, she took a wide range of courses and completed projects focusing on marine design and production. These projects included design optimization of an offshore tension leg platform, a complete design of a multi-ship yacht transport fleet, and a biomechanical study of the risks posed to a person in a traditional daisy chain used to load supplies onboard a ship.

LT Woodman's focus on marine safety began in the summer of 2007, when she was an intern at the MSC. During her internship, then 1/c Cadet Lisa Myatt assessed the degree of safety afforded by the Pontoon Simplified Stability Test (PSST) when compared to existing and proposed stability standards. Her work confirmed that the PSST is conservative, but also that it is extremely sensitive to geometric and loading parameters. She continued the project as a directed studies course at the CGA, where her parametric study analyzed 47,628 different vessel configurations to determine the impact of vessel geometry on passenger capacity. Lisa's cadet internship was featured in the December 2008 edition of the MSE Newsletter, and the resulting passenger count estimating tool she created was published in the Journal of Ship Production and Design, May 2010.

Lisa represents a growing number of officers who have begun preparing for a potential career in the Coast Guard's Marine Safety Engineering sub-specialty while a cadet at the earliest stage of their career. Her progression from Naval Architecture and Marine Engineering student, to MSC cadet intern, to shipboard engineer and post-graduate engineering student, and on to her current assignment as an MSC engineer and future Salvage Engineering Response Team Duty Officer, has prepared her well for an exceptionally productive and rewarding career in the Marine Safety Program.

"The reason I was first drawn to the Marine Safety Program is that it is a field where the daily use of technical knowledge to analyze complex and novel engineering problems leaves a huge impact on the maritime world. It is an opportunity to use your technical background to save lives before something goes wrong." - LT Lisa Woodman

Post-Graduate Selectees for AY 2013

Chemical Engineering

LTJG Michael Comerford

Electric Power Systems and Controls Engineering

ENS Anna Moorman

Fire Protection Engineering

LT Christopher Briggs

Marine Engineering

LT Brandon Horne
LT Andrew Czarniak
LT Karima Greenaway
LT Kevin Kuhn
LTJG Paul Folino
LTJG Brock Hashimoto
ENS Michael Laurence
ENS Brian Bonomi
ENS William Cotta
ENS Daniel Burke
ENS James Carter

A Move Towards Non-Pyrotechnic Distress Signals

The Lifesaving and Fire Safety Division (CG-ENG-4) is coordinating with the Research and Development Center to evaluate the potential use of non-pyrotechnic distress signals such as lasers. Future tests will assess storage, maintenance, and rescuer perception as a distress signal of such innovative devices compared to conventional pyrotechnics.

Burning pyrotechnic devices on boats, particularly gasoline powered ones, or in survival craft packed with people, creates an obvious potential hazard. Pyrotechnic flares also contain perchlorate, a known carcinogen, and present environmental problems due to seepage into groundwater. Many landfills and trash services will not accept them for disposal.

Electronic devices are not without problems, as lasers can potentially cause eye damage to SAR personnel, particularly when wearing night vision equipment. The law prohibits aiming a laser device at an aircraft, except for emergencies--but even then, current Coast Guard SAR doctrine is to turn assets away from any laser exposure, thereby preventing them from rendering mission support.

Further investigation is required, but research suggests that LEDs and perhaps some non-directional laser devices show promise of meeting approval requirements without risk of damaging pilot vision.

ECA Requirements Spark Interest in LNG as Vessel Fuel

by Mr. Tim Meyers, Master's Degree in Chemical Engineering

In August of this year, air emissions requirements adopted under MARPOL Annex VI and the EPA's Act to Prevent Pollution from Ships came into force for vessels operating within a designated Emission Control Area (ECA) extending 200-miles off the coasts of North America and the Hawaiian Islands. Certain vessels operating within the ECA are now limited to using fuels with less than 10,000 ppm (1.0%) in sulfur content. This is part of a larger stepped approach to reducing global emissions of nitrogen oxides (NOx), sulfur oxides (SOx), and particulates through the use of lower sulfur fuels, more efficient engines, and engine after-treatment technologies. The stricter standards have led many vessel operators to consider switching to LNG fuel as an alternate means of compliance.

Harvey Gulf LNG-Fueled OSV – under construction at Trinity Offshore, Gulfport, MS

Our Winter 2011 edition of the MSE Newsletter highlighted this growing interest in LNG-fueled vessel technology (see "Natural Gas-Fueled Vessels: Coming Soon", pg. 3). Among the half-dozen vessel plans already submitted for concept approval are designs for the retrofit of Washington State Ferries ISSAQUAH class passenger vessels, RO/RO container ships operated by TOTE, and the coal-fired Great Lakes ferry BADGER. Interest is also being raised in the use of LNG on cruise ships, tankers, and inland towing vessels; and construction is already underway at Trinity Offshore Shipyards on the first of four dual-fuel (diesel and LNG) OSV sister vessels to be built for Harvey Gulf International Marine.

The Systems Engineering Division (CG-ENG-3) recently developed policy that streamlines the review process for LNG-fueled vessels by providing up-front design criteria that the Coast Guard will accept as an equivalency to regulatory requirements for systems using conventional marine fuels. A concept review is not necessary for arrangements done in accordance with the policy. The details of the design will be reviewed by the Marine Safety Center to confirm compliance. Policy Letter 01-12 is available for download at www.uscg.mil/hq/cg5/cg521.

Mr. Tim Meyers at gas fueled ship conference in Rotterdam

To increase awareness of the new policy and encourage dialogue, CG-ENG-3 has actively engaged industry by providing guest lecturers and panel session speakers at various marine conferences. This outreach effort included participation in training sessions hosted by both the ABS Academy and DNV. CG-ENG-3 engineers will continue to address LNG-fueled system design technology as they participate within the IMO as well as with numerous voluntary consensus standards organizations including ISO and NFPA.

Shale Gas Extraction Waste Water

Shale gas is an "unconventional" natural gas that is extracted by hydraulic fracturing. Water, sand, and chemicals are pumped under high pressure into the shale causing the rock to fracture and release the natural gas. Today, it accounts for about 20% of U.S. production. The shale gas extraction waste water (SGEWW), also called "frac" water, is stored at the drilling site or transported by rail or truck. Industry has expressed interest in transporting SGEWW by barge to disposal sites in OH, TX, and LA.

SGEWW chemical composition varies depending on chemicals in the drilling fluid, the drilling site, and age of the well. SGEWW is generally very high in total dissolved solids, which can include some heavy metals such as mercury, arsenic, and barium, and it may contain a small amount of VOCs such as benzene. The main concern with SGEWW is its potential for contamination with radioactive isotopes such as radium-226 and -228. Radium is of particular concern because it is chemically similar to calcium and so will easily form surface residues and may lead to radioactive surface contamination of the barges. The Hazardous Materials Division (CG-ENG-5) is currently formulating policy to allow this waste water to be safely transported for disposal..

Gas Rig

Cadet Interns at MSC: Training Tomorrow's MSEs Today

by LCDR Daniel Cost, P.E., Master's Degrees in Naval Architecture and Marine Engineering, Mechanical

Each summer top ranking Coast Guard Academy (CGA) cadets, entering their senior year, are selected to take part in the CGA Summer Internship Program. For the past five years, the Marine Safety Center (MSC) has volunteered to host cadets majoring in engineering. As the Coast Guard's technical center of expertise for commercial vessels, the MSC offers cadet interns a great opportunity to see the practical application of their engineering education in the Coast Guard's role in regulating the marine industry.

The cadet interns work alongside MSC staff engineers conducting technical reviews of commercial vessel structures, stability, machinery, electrical and fire protection systems. In addition, each cadet chooses an independent research project focused on a technical issue of interest to the Prevention community.

Cadet 1/c Catherine Walker

This past summer, 1/c Catherine Walker, a Naval Architecture and Marine Engineering major, compared the structural requirements for aluminum vessels in NVIC 11-80, "Structural Plan Review Guidelines for Aluminum Small Passenger Vessels", to those in the ABS Guide for High Speed Craft. Her results indicated that NVIC 11-80 often allows smaller scantlings than the ABS Guide and suggests that further review of NVIC 11-80 as a new construction design standard is warranted.

1/c Ian Sankey, a Mechanical Engineering major, analyzed a proposed solution to assist Marine Inspectors conducting Simplified Stability Tests (SST) when the required vertical center of gravity (VCG) of the test weight cannot be achieved. The proposed solution is a calculation that determines an extra heeling moment to account for the difference between the actual and required VCG. 1/c Sankey used General HydroStatics (GHS) software to simulate a series of SSTs, comparing the vessel heel angles with and without the correction. His results indicate that the proposed correction is accurate and can easily be achieved in the vast majority of SSTs.

Cadet 1/c Ian Sankey

Cadet internships at the MSC not only improve current policies, but also equip future MSEs to handle the technological challenges associated with the rapid advances in the maritime industry.

As you come across information that may be of interest to young engineers, or have suggestions for senior engineering design projects that will raise awareness of the Prevention community at CGA, please email your thoughts to LCDR Dan Cost at Daniel.H.Cost@uscga.edu.

"In all of my developmental assignments, I've found that the way in which engineers approach problem solving is beneficial to any job. At the same time, these assignments also taught me to consider the role of other dimensions (i.e., political, interpersonal, and financial) in achieving an optimal answer. Sometimes the science and engineer foundation won't win the argument—but I've always found that it's a great place to start."

Office of Design and Engineering Standards (CG-ENG)

CG-ENG is divided into five technical divisions

Human Element and Ship Design Division (CG-ENG-1)

Naval Architecture Division (CG-ENG-2)

Systems Engineering Division (CG-ENG-3)

Lifesaving and Fire Safety Standards Division (CG-ENG-4)

Hazardous Materials Division (CG-ENG-5)

Who's Who In Marine Safety Engineering: CAPTAIN JOHN MAUGER

by LCDR Latasha Pennant, Master's Degree in Business Administration

MSEN: Congratulations on your assignment as the Chief of the Office of Design and Engineering Standards (CG-ENG). Can you provide a snapshot of your career as a Marine Safety Engineer (MSE)?

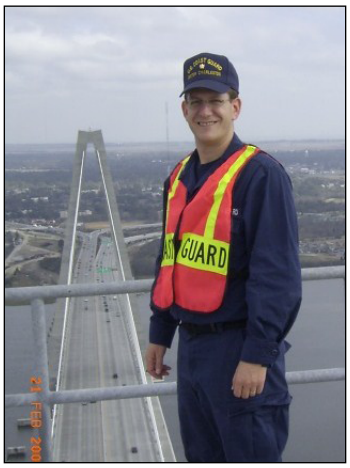
JM: I was a student engineer on a 378, served a staff tour in C4IT/EE and entered Prevention as a LT through fire protection engineering graduate school. After graduate school, I served at the Marine Safety Center (MSC). Following MSC, I served as the Senior Investigator and an inspector at Activities Europe and as Chief of Prevention at Sector Charleston. Since leaving Charleston, I've had a series of one year assignments in DC, where I've had the opportunity to really understand how the government works at different levels.

MSEN: As a senior officer in the Coast Guard, what other non-engineering professional development opportunities complemented your career as a MSE?

JM: I've been fortunate to be in the right place at the right time for a number of different development opportunities. After 9-11, I volunteered to stand-up the port security directorate, where I leveraged relationships with vessel safety professionals. In 2008, I enrolled in an executive leadership program sponsored by CG-1, which opened up opportunities to work on the 2008 Presidential transition and on the development of the Coast Guard's acquisition budget. Most recently, I graduated from Senior Service School and spent a year working in a think tank at the Pentagon.

MSEN: What are some of the highlights of your career? Any "sea stories"?

JM: While at the MSC I traveled all over Europe, to Japan, New Zealand and the Caribbean examining cruise ships and sponsored a change to the SOLAS regulations with regard to the design of escape doors. It was really empowering to see my experience and ideas incorporated into regulations. In Charleston I participated in a year-long effort to demolish two bridges over the main shipping channel. It was a neat project involving a number of technical and political issues, with a beautiful new bridge as a reward for all of the hard work.



CAPT Mauger on the Arthur Ravenel Jr. Bridge

MSEN: As CG-ENG, you are responsible for recruiting military and civilians. What advice can you offer to those considering a MSE career in the Coast Guard?

JM: When folks learn about the types of projects we are working on the career really sells itself. MSEs are currently working on the leading edge of a variety of maritime engineering disciplines including new sources of fuel for ships, new types of ships and facilities for finding and producing energy, and new cruise and cargo ship designs, among other things. I'd welcome anyone who is considering a career to stop by CG-ENG or the MSC and see first-hand what we are doing.

MSEN: Thank you CAPT! Do you have anything else you would like to share?

JM: I'd encourage all of our readers to make sure that they're getting out and learning the business, it's one of the most fun and rewarding aspects of the job.

Hybrid Tug Battery Fire

MSC Staff Engineers LT Brian Meadowcroft and LT Bryson Jacobs visited Sector LA/LB in August 2012 to assess the damage incurred during a fire aboard the CAMPBELL FOSS hybrid tug vessel. This marked the first marine-application Lithium Ion (Li-Ion) battery explosion and fire to be reported to the MSC. The engineers observed firsthand the inherent dangers of an emerging green technology, the techniques and practices necessary to avoid energetic failures, and the challenges encountered when traditional fire protection measures are used to fight a Li-Ion battery fire. Currently, only lead-acid type batteries are addressed by federal regulations; the benefits and concerns of any proposed Li-Ion system must be reviewed on a case-by-case basis. This event highlighted the need for detailed scrutiny and regulation of novel electrical storage and control installations in addition to the fire protection methods necessary to ensure life safety and vessel survivability.

LT Jacobs of the MSC assesses fire damage within the Lithium-Ion battery compartment

IMO: Passenger Ship Safety Initiatives

by LCDR Catherine Phillips, Master's Degree in Naval Architecture and Marine Engineering

In May 2012, representatives from the Commercial Regulations and Standards Directorate (CG-5PS) attended the Maritime Safety Committee (MSC), the highest technical body of the International Maritime Organization (IMO), in London, to develop interim passenger vessel safety measures in the wake of the COSTA CONCORDIA casualty. On January 13, 2012 the Italian flagged cruise ship ran aground off the coast of Tuscany, causing significant damage to the vessel's hull. The aftermath of the grounding led to the evacuation of more than 4,200 passengers and crewmembers and significant loss of life. Despite the Italian government's legal requirement to complete a criminal investigation before commencing a marine casualty investigation, IMO undertook the initiative to ensure that appropriate and timely actions were taken in response to this maritime catastrophe. Recommendations put forth were adopted by the Assembly and are currently being implemented by the passenger ship industry. Among the interim recommendations are operational measures for passenger ships to:

COSTA CONCORDIA aground off the coast of Tuscany

1. carry additional lifejackets in public spaces;
2. review the adequacy of the dissemination and communication of the emergency instructions to passengers, taking into account the number of languages likely to be understood by the passengers on board;
3. conduct the muster and safety briefing of newly-embarked passengers prior to departure from any port where passengers are embarked;
4. restrict access of non-essential personnel to the navigation bridge during certain operations and;
5. ensure adequate voyage planning taking into account relevant IMO instruments.

IMO member states were also encouraged to take appropriate action to ensure their current safety standards and procedures are fully and effectively implemented. The Coast Guard's Prevention community answered the call by requiring Inspectors to witness passenger musters as part of our mandatory vessel examination program. Marine Safety Engineers, working through IMO, are at the forefront in developing a long term action plan on passenger ship safety which addresses proposals for equipment and design, human element factors and communication and, evacuation.

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

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