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Marine Safety Engineering

A Note From The Director

Greetings! Welcome to the spring 2015 edition of the Marine Safety Engineering (MSE) Newsletter. Presently, the Coast Guard is at the forefront of the American Energy Renaissance, a shift in energy production that will have a broad impact on maritime trade and the demand for qualified marine safety engineers. This issue of the newsletter focuses on the energy renaissance and includes a sample of the outstanding work already being done at the Marine Safety Center and Headquarters to solve emerging problems.

Admiral Zukunft listed the energy renaissance as one of his four major areas of emphasis in his State of the Coast Guard Address. He directed a service-wide effort to revitalize the marine safety enterprise and focus on inspections and the regulatory framework. This effort will be significant, and will take time, but we are already making strides within marine safety engineering to meet these crucial objectives. The increase in American energy production will result in increased cargo throughput in the maritime domain, and we must rise to the challenge of facilitating commerce without losing sight of the constant need to protect the safety of mariners and the environment.

In reading through this newsletter you will learn about our recent regulatory accomplishments related to large OSVs, the Deputy Commandant for Operations strategies for the Energy Renaissance, and the technology and operational changes on the Outer Continental Shelf.

I offer my sincere thanks to CAPT John Mauger of the Office of Design and Engineering Standards (CG-ENG), who departed this spring for his new role as Commanding Officer of the Marine Safety Center. To that end I heartily welcome aboard CAPT Benjamin Hawkins to CG-ENG. I also extend my deep appreciation and congratulations to RDML John Nadeau who recently completed an outstanding tour as Commanding Officer of the Marine Safety Center and was promoted to rear admiral.

Finally, I extend my heartfelt and deep appreciation for the hard work our staff engineers have put into addressing the regulatory challenges of the innovative, ever-changing marine market. I encourage all of you to share your experiences with the next class of MSEs as we look to recruit and retain additional talented professionals. The spring season is finally upon us, which means more time to enjoy outdoor activities (like golf) and plan summertime fun and time with our families. Please stay safe, enjoy time off when you have it, and stay laser-focused on our very important and crucial mission of facilitating commerce through well thought out regulations and policy documents.

Regards,

Jeff Lantz,
Director of Commercial Regulations and Standards

Energy Renaissance

By CDR Kevin Ferrie, Master's Degree in Naval Architecture and Marine Engineering

Offshore and inland domestic oil and gas production has hit record levels and is projected to continue to grow through future decades. In October 2013, for the first time in twenty years, the U.S. produced more oil than it imported. During the first quarter of 2014, the U.S. became the world's largest producer of both hydrocarbon liquids and natural gas. Although the current downtrend in the price of crude oil has slowed U.S. production, the infrastructure has been put into place to continue to produce at record levels as economic conditions become more favorable.

LLOG's DELTA HOUSE semi-submersible Floating Production System (FPS) established initial production in the Gulf of Mexico in early 2015.

With domestic energy production predicted to rise for at least the next five years, there will be an increased demand on the U.S. Marine Transportation System to support the production and transportation of oil and gas. This will present a challenge to ensure safety, security, and environmental stewardship in a way that will allow our nation to enjoy the full economic benefit of this American Energy Renaissance. As a result, the Coast Guard is committed to engaging with industry and working to keep pace with the swift changes in technology and energy production to ensure that we are able to meet the demands of facilitating commerce.

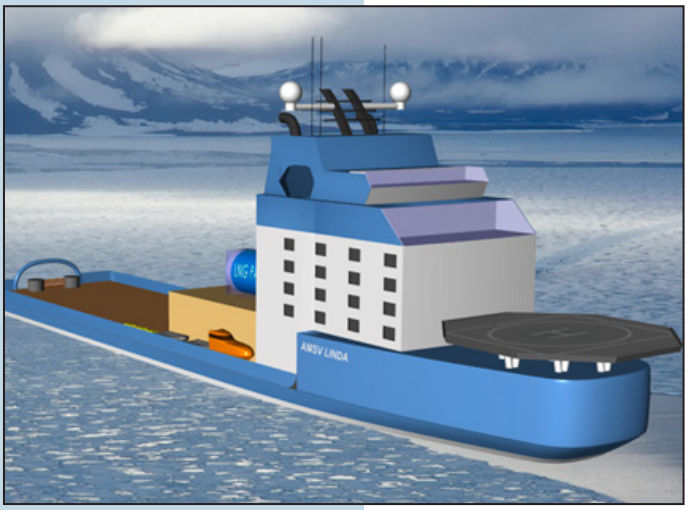
Demand for new tank barges to transport domestically produced oil and chemicals has been very high for several years.

The Coast Guard is working to revamp the marine safety field by focusing on marine inspections and the regulatory framework. Recruiting, training, and retaining skilled and highly experienced marine inspectors and regulatory/policy developers is crucial to facilitating the increased use of our waterways for oil and natural gas. Great emphasis is being placed on the need to understand the highly complex systems being used in domestic oil and gas production. Without the technical capability to keep pace with industry, we cannot effectively mitigate new risks presented as a result of the renaissance.

The American Energy Renaissance will undoubtedly lead to greater demand for the skills that Marine Safety Engineers provide through a specialized, technical career. Whether evaluating state-of-the-art dynamic positioning systems, the world's first LNG-fueled containership, or the first of its kind deep water well containment system, Marine Safety Engineers are in high demand. This demand will only increase as the systems used in domestic oil and gas production continue to increase in complexity.

Arctic Service and Alternative Fuel Sources Headline CGA NA&ME Capstone Design Projects

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



Glacial Barco's Design of a Dual Fuel, Double Acting Arctic Multipurpose Support Vessel.

Ship design is a challenge; this year's seniors in the Naval Architecture and Marine Engineering major at the Coast Guard Academy learned first-hand that design really is a blend of science and art. They applied their skills to the design of military and commercial ships for light to medium arctic service (IACS PC5, PC6), while also tackling the implementation of alternative fuels and engine designs necessary to meet tighter environmental emissions restrictions.

Three of the six teams designed a Coast Guard Arctic Patrol Cutter to support Coast Guard operations during the extended Arctic summer season, with mission sets including maritime domain awareness, search and rescue, law enforcement, and defense readiness. The other three teams worked on Arctic Multipurpose Support Vessels for escort, personnel transport, pollution response, ice management, emergency towing, and contingency operations during the summer season. The teams were asked to apply the IMO Polar Code, in addition to other applicable regulations.

After evaluating owner requirements and studying similar ships from the Coast Guard and commercial firms such as Glosten and Edison Chouest Offshore, cadets used various software tools including Rhino, GHS, NavCAD, Maestro, and ShipX to create and analyze their designs. Along the way, they've engaged with subject matter experts at CGHQ and MSC and had the opportunity to visit with experts in the field from Aker Arctic, Arctia Shipping, and the ABS Harsh Environment Technology Center.

1/c Naval Architects with Mr. John Dolny from the ABS Harsh Environment Technology Center.

Three of the teams explored Liquefied Natural Gas (LNG) as a fuel. Using available references from IMO, CG-ENG, and classification society standards, they tackled design trade-offs (e.g. extra storage volume, limited types of LNG-capable engines), LNG safety requirements (e.g. tank types, cold boxes, double wall piping, isolation from accommodations), and the current infrastructure challenges(homeport limitations). However, they also learned that LNG has benefits as an environmentally friendly fuel source that is abundant in supply and relatively inexpensive, especially when compared with ultra-low sulfur diesel fuels.

The cadets learned a lot this year and have a much greater appreciation for the challenges and rewards of the contemporary ship design experience and the value of their skills as Naval Architects and Marine Engineers, both in the Coast Guard and maritime community. The teams presented their designs in late April and early May at CGA, CGHQ/MSC, and the Offshore Technology Conference (OTC) in Houston.

Congratulations and Welcome to the MSE Community to the Following Graduates of the MSE Advanced Education Program:

Chemical Engineering - HAZMAT
LT Mike Comerford - MSC-3

Electrical Power Systems & Controls Engineering
LT Anna Moorman - MSC-2

Fire Protection Engineering
LT Christopher Briggs - ENG-4

Marine Engineering
LT Brian Bonomi - MSC-2

LT Daniel Burke - MSC-1

LT James Carter - MSC-5

LT William Cotta - MSC-3

LT Andrew Czarniak - MSU Morgan City

LT Paul Folino - ENG-1

LT Karima Greenaway - ENG-1

LT Kevin Kuhn - ENG-3

LT Michael Laurence - MSC-1

Marine Safety Engineering Program Manager:
LCDR Jennifer Doherty

Where Are They Now: CAPT Josh Reynolds

By LT Jason Kling, Master's Degree in Reliability Engineering

MSE: *Can you provide us with a brief background of your career and describe your current assignment?*
JR: I started out in Naval Engineering with assignments as an engineer on a 270' and a ship superintendant at the CG Yard. I became a "techie" in 1999 after I graduated from Georgia Institute of Technology with an Electrical Power and Controls Degree. I had several Marine Safety Center and Headquarters assignments where I was able to apply my degree in a number of fascinating and productive ways. One of the most important ways was regulatory, policy and training improvements for offshore units after Deepwater Horizon, which led to my current assignment the Chief of the Eighth District Outer Continental Shelf Division and OCMI for Production and Drilling units in the Gulf of Mexico. This is a brand new position, created by final rule published on April 15, 2015 in 80 FR 20159.

CAPT Josh Reynolds.

MSE: *District Eight seems to be the focal point of the Energy Renaissance. What type of work is going on in D8?*
JR: It really is. The quickest sound bite to describe it to Coast Guard folks is "D8 is to the Energy Renaissance as D7 is to Drug and Migrant Interdiction." The game changer is increased oil and gas production driven by advancing technology - huge oil & gas reserves are suddenly economically viable to recover. Import of oil and gas is being replaced by export, and products are moving by U.S. vessels along rivers, the ICW, and coastal routes. This is just the obvious effect. Hydrocarbon based petrochemical products that used to be imported (plastics, fertilizers, chemical feedstock) are produced and transported locally. Huge reserves up to 200 miles offshore are accessed via high pressure/high temperature wells in up to 10,000 feet of water. Large floating production units that produce 100-200k bbls oil/day are being moved into place.

MSE: *It sounds like there is a lot of technical work required of the Coast Guard outside of the Marine Safety Center and Office of Design and Engineering Standards. What skills do Marine Safety Engineers possess that make them valuable to field units?*
JR: The technical complexity of the American Energy Renaissance gives "techies" a virtually unlimited supply of meaningful and challenging work! Sector and MSU Commanders are hungry for officers who can understand and relate to the industry they oversee under their OCMI and COTP authorities.

MSE: *Do you think being a Marine Safety Engineer has helped your career?*
JR: It really defined it. Being a Marine Safety Engineer was extremely satisfying to me and why I have remained in the Coast Guard as long as I have. By the way, the American Energy Renaissance is here to stay and techies will always be needed by the Coast Guard. For example, the offshore oil and gas industry thinks in the billions and plans decades ahead when it puts into place its deepwater production units. To them, the current drop in oil prices is a "blip" on the radar screen.

(continued on page 5)

Where Are They Now: CAPT Josh Reynolds (cont.)

MSE: *Do you have any closing thoughts or advice for new Marine Safety Engineers?*
JR: I have always been able to meet the Coast Guard's needs with assignments I truly enjoy. Being a Coast Guard officer takes a lot of effort, you might as well love what you do! I encourage any new Marine Safety Engineers with the "bug" for challenging technical assignments to sign up for as many as you can! Also, many of my friends who are also Marine Safety Engineers have pursued and been selected for competitive out-of-specialty assignments (in CG-8 or CG-7, for example) and capitalized on the enormous opportunity to give perspective to our senior leaders. Because Marine Safety Engineers have transferrable analytic and problem solving skills, they are well positioned for these assignments and can shape the focus of our organization.

Tackling Expansion of OSV Operations in the Gulf: Part II

By LT Anne Besser, Master's Degree in Naval Architecture and Marine Engineering

HOS RIVERBEND Post Conversion.

Given the current world market that requires ships capable of versatile operations, the U.S. fleet of Offshore Supply Vessels (OSVs) has become more multifunctional than their traditional predecessors. Many smaller companies are seeking international certificates for the first time on OSVs that could be upwards of 40 years old, while other companies are looking for ways to maximize their OSV fleet usability. OSVs that have the flexibility to support anchor handling, diving, ROV, well service, and accommodations, in addition to the traditional capabilities of transporting supplies, drilling fluids, workers, etc., are more likely to gain contracts, increasing their profitability. Industry looks to meet this demand through vessel modifications that may require additional notification, design basis, plan review, and oversight.

Recently, a team of Marine Safety Engineers from the Office of Design & Engineering Standards and the Marine Safety Center worked closely with vessel designers, ABS, and Coast Guard field inspectors to provide an approved design basis for the first U.S. Flagged OSV to provide accommodation services on the U.S. Outer Continental Shelf, the HOS RIVERBEND. Given the vessel's capacity for a larger than traditional number of offshore workers, careful consideration was given to damage stability, subdivision, fire safety, and escape arrangements when reviewing the modifications to the original design. The recent "Interim Rule on Offshore Supply Vessels of at Least 6,000 GT ITC" (79 FR 48894, Aug 18, 2014), to include new subpart F "Construction and Arrangements for OSVs Carrying More than 36 Offshore Workers", served as the preliminary design basis, with additional review and acceptance for specific modifications and novel equipment, such as the motion-compensated transfer bridge.

While current standards address traditional OSV operations, additional offshore activities such as well operations (see "Tackling the expansion of OSV operations in the Gulf" in the Spring 2014 MSE newsletter) and accommodation service present the Coast Guard, classification societies, vessel designers, builders, and operators with challenges when determining the appropriate regulatory framework or novel design basis under which to build the vessel. Marine Safety Engineers will continue to work hand-in-hand with industry and the field to address the expanding and evolving OSV industry, while working to bridge regulatory gaps and provide effective safety standards.

MSE Advanced Education Opportunities for AY2016

Do you know an officer who would be a good candidate for the Marine Engineering, Fire Protection Engineering, Chemical Engineering, Mechanical Engineering, or Electrical Power & Controls Engineering Advanced Education Programs? Encourage them to apply and earn their post-graduate degree under the Marine Safety Engineering program!

This year, the Marine Engineering program will select 10 officers to attend graduate school to earn Master of Science degrees in a variety of disciplines, including:

- Marine Engineering
- Naval Architecture
- Ocean Engineering
- Petroleum Engineering

Additionally, one officer will be selected to earn a Master of Science degree in each discipline below:

- Chemical Engineering
- Fire Protection Engineering
- Electrical Power & Controls Engineering
- Mechanical Engineering

Interested officers may check the following links for more information or contact the Marine Safety Engineering Program Manager. The deadline to apply is June 26, 2015.

Advanced Education Opportunities

OPM-1 Post Graduate Information

Marine Safety Engineering Program Manager:
LCDR Jennifer Doherty

Marine Well Containment Vessels

By LT Frank Strom, Master's Degree in Systems Engineering

Kiewit Offshore for module modifications in Ingleside, TX.

After the Deepwater Horizon Oil spill, four major oil companies formed the Marine Well Containment Company (MWCC) to provide the kind of well containment capabilities needed to mount an effective response to a subsea well control incident at depths of up to 10,000 feet. The project involved the conversion and outfitting of two novel tankers, giving them the ability to operate normally as shuttle tankers, and quickly be converted to modern floating production, storage and offload (FPSO) facilities should a similar incident occur in the future. These Marine Capture Vessels (MCVs) -- EAGLE TEXAS and EAGLE LOUISIANA -- recently completed modifications in what was clearly among the most complex projects attempted in the maritime industry in recent years.

The five-year timeline from concept review to conversion and sea-trials presented many challenges to Marine Safety Center (MSC) plan reviewers and field inspectors alike. Aside from the vast regulatory differences between tank vessels and FPSOs, having to alter a majority of the deck layout on the MCVs to accommodate the process equipment presented significant problems. Working closely with the project's design team, MSC evaluated the safety afforded by proposed emergency egress routes, hazardous area zones, and structural fire protection (SFP) boundaries. This was no small task given that the vessels' main decks are completely covered with hydrocarbon process modules. The problems presented by these modules were extraordinary from a regulatory perspective. They seemingly blocked all existing egress routes, increased SFP requirements everywhere, and made the majority of the deck a hazardous area. The safe resolution of these issues challenged all the project engineers and plan reviewers and required creative solutions to address the unique risks presented by the unusual arrangements.

When planning for the rapid deployment of the MCVs, the designers used several technologies. One example is the use of a sophisticated dynamic positioning system. The MCVs are equipped with DP2 dynamic positioning systems, which are designed so that no single fault in the active system will lead to system failure. Each MCV's DP2 system is comprised of four azimuth thrusters, one bow tunnel thruster, and controllable pitch propellers to maintain a geostatic position and ensure the umbilical and flexible flow lines will not be compromised by ship motions during operation.

Following a marine well blowout, the tankers would transit to Ingleside, TX where their modules are sheltered and maintained. The modules would then be fitted on the tankers, transforming them into MCVs capable of performing the marine well cap and flow mission. The MCVs enhance the capability of the overall Marine Well Containment System by allowing the well to be capped and flowed rather than simply capping the compromised wellhead. Each MCV has the capability of processing up to 50,000 barrels of liquid per day and has storage capacity of 700,000 barrels of liquid, which can be offloaded to shuttle tankers.

The magnitude of this project was impossible to comprehend at its outset in 2010. All told, the Marine Safety Center performed over 3,700 man-hours of work on the project, completing in-depth engineering reviews of over 920 distinct plan review activities.

Engineer in the Spotlight

By CDR Pete Gooding, Master's Degree in Naval Architecture and Marine Engineering

RDML John P. Nadeau, Assistant Commandant for Capabilities (CG-7).

On April 27, 2015, RDML Nadeau handed over the reins of the Marine Safety Center (MSC) to Captain John Mauger and was promoted (frocked) to the rank of rear admiral (lower half). RDML Nadeau is now assigned as the Assistant Commandant for Capabilities (CG-7), where he is responsible for leading the identification and sourcing of capabilities, competencies, and capacities needed to meet all Coast Guard mission requirements.

Prior to serving as the MSC's Commanding Officer, RDML Nadeau was Chief, Office of Design and Engineering Standards at Coast Guard Headquarters, and led development and implementation of regulations and policy for commercial vessel safety and environmental protection. He had the opportunity to represent the U.S. as Head of Delegation at the International Maritime Organization and participated in development of a variety of new international standards.

He was the Commanding Officer, Marine Safety Unit Wilmington from 2007 to 2010. As the Captain of the Port and Officer in Charge, Marine Inspection, he was responsible for all marine safety, maritime security, and environmental response activity in the Port of Wilmington and Southeastern North Carolina. Other operational assignments include Senior Investigating Officer at Activities Baltimore, Maryland, and Chief of Inspections and Chief of Port Operations at Marine Safety Office Corpus Christi, Texas. During two previous tours at the MSC, RDML Nadeau served as a staff engineer in the Cargo Division, Chief of the Tank Vessel and Offshore Division, Chief of the Hull Division, and leader of the Salvage Engineering Response Team.

Throughout his career, RDML Nadeau has repeatedly applied the postgraduate education, engineering training, and technical competencies he acquired as a Marine Safety Engineer. Some of the highlights include working on cutting-edge projects such as the new class of subsea response vessels developed after the DEEPWATER HORIZON oil spill, participating in development of national policies for the use of liquefied natural gas (LNG) as a marine fuel, providing real-time casualty engineering support to Coast Guard Captains of the Port and Federal On Scene Commanders during high profile national disasters and vessel casualties, and serving on the Commandant's Marine Board of Investigation for the sinking of the F/V ALASKA RANGER with loss of life.

In reflecting on his career, RDML Nadeau noted that he has regularly relied on his "techie" training, experience, and tools to dissect and solve large, complicated problems. The MSE skill sets have improved his ability to think critically and communicate complex issues to diverse audiences. He is certain these same competencies will enable him to succeed as CG-7.

For those officers considering postgraduate school and those that only recently became MSEs, RDML Nadeau advises that "the need for talented engineers in the Coast Guard has never been greater. The health of the Prevention program and successful execution of the Marine Safety mission relies on the regular supply of technical experts that thoroughly understand commercial vessel design, construction and operations." He sees a steady stream of new technology finding its way onto commercial ships, noting that the Coast Guard will need to work with industry to ensure these innovations are incorporated safely. And for those MSEs already serving at MSC, Office of Design and Engineering Standards, or out in the field, RDML Nadeau reminds you to "Step out of your comfort zone and constantly challenge and stretch yourself. Opportunity sometimes comes in disguise, so don't be afraid to go for it!"

MSC Support of Dynamic Positioning System Testing in the Gulf

By LT Margaret Woodbridge, Master's Degree in Mechanical Engineering

Recent years have seen a dramatic increase in the use of Dynamic Positioning (DP) systems onboard Mobile Offshore Drilling Units (MODUs), drillships, and the vessels that support them. As drilling operations in the Gulf of Mexico continue to move farther offshore and into deeper waters, the precise station-keeping capabilities of DP technology have become indispensible. By the same token, a loss of position due to a DP system failure could lead to serious consequences for both human and environmental safety.

Not surprisingly, the number of automation and DP plans received by the Electrical Branch of the Marine Safety Center (MSC) has more than doubled in the past five years. Personnel in the Electrical Branch have extensive experience with these systems, and routinely review complex plans, interact with industry and classification societies, provide expert insight to automation casualty investigations, and give technical advice to field inspectors responsible for issuing Certificates of Inspection and Certificates of Compliance. When a MODU, drillship, or support vessel is first delivered or enters the Gulf of Mexico, it must undergo a comprehensive Coast Guard examination, which includes DP testing. Local marine inspectors have increasingly sought MSC's technical support in witnessing tests that prove the overall reliability and redundancy of some of the more complex and high-risk DP systems, such as on those vessels operating with a closed-bus electrical plant configuration.

A closed-bus configuration is an operating arrangement in which all or most of the switchboard bus ties are closed, creating a unified bus. This mode of operation is attractive to operators because fewer engines are required to power the vessel's overall load, translating to significant savings in fuel and maintenance costs. Additionally, many operators claim that it is more reliable than an open-bus configuration by providing increased plant stability for large load fluctuations. Conversely, a single electrical fault or power-management failure can take down the entire unified bus, potentially blacking out the vessel during high-risk offshore operations.

Mr. Lee Franklin witnessing DP tests on the EAGLE TEXAS.

While onboard these vessels, Electrical Branch members witness the selective testing of the power management system and provide DP system training to local Coast Guard marine inspectors. Electrical Branch personnel have visited five MODUs and drillships this year alone, and over the past few years have identified hidden failure modes in the power management systems of several vessels.

Demand for technical support for onsite field testing of DP systems is expected to increase once the proposed Coast Guard DP Rule goes into effect. The proposed DP Rule draws heavily on the guidelines laid out in Marine Technical Society publications and IMO MSC/Circ. 645 to establish a risk-based approach for regulating vessels engaged in Outer Continental Shelf activities, including foreign-flagged MODUs.

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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