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Marine Safety Engineering

A Note From The Director

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

This issue leads off with an article featuring the Marine Safety Center's Brian Thomas, who recently appeared in the National Geographic Channel's two-hour special *Titanic: The Final Word with James Cameron*. Brian's extensive naval architecture knowledge and experience landed him on the eight-person "Dream Team" that Cameron assembled to study the wreckage and more accurately determine the timeline and sequence of events that occurred when the "unsinkable" passenger ship went down 100 years ago.

We continue to strengthen our own engineering "Dream Team" through our annual campaign to identify and recruit the next generation of Marine Safety Engineers. This year, we have expanded our advanced education opportunities to include a dedicated postgraduate degree program in Electrical Power Systems & Controls Engineering. We need more engineers who are knowledgeable in the safe design and testing of technologically advanced electric hybrid propulsion systems, and automatic controls such as dynamic positioning systems on floating offshore facilities. We have also expanded the diversity of other postgraduate fields of study to keep pace with advancements in the industry we oversee. If you are a Marine Safety Engineer, please pass the word to potential candidates!

Ongoing development of standards related to Outer Continental Shelf (OCS) activities remains a major area of emphasis and presents interesting challenges given the rapid rate of change in the offshore industry and its technologies. Recently, I was honored to address the Offshore Technology Conference (OTC) panel entitled "Focus on Safety and Spill Response in the post-Macondo Era," where I outlined the Coast Guard's "One Gulf -- One Standard" regulatory approach and the initiatives we have undertaken to ensure public expectations for safety and environmental protection are met on the OCS. My experiences on a recent offshore visit to a variety of vessels and facilities operating on the OCS in the Gulf of Mexico reinforced the importance of our standards development work.

Finally, I would like to congratulate the new Marine Safety Engineers who are graduating from our postgraduate programs this spring. We look forward to working with you here at Coast Guard Headquarters and at the Marine Safety Center on challenging technical projects currently underway or on the horizon. I would also like to thank those of you who are tour complete and moving on to other assignments. Through your work over the past several years, you have contributed significantly to the achievement of our marine safety goals. The knowledge and skills you gained while serving in the Standards Directorate or the Marine Safety Center will make you a particularly valuable Coast Guard asset in your next assignment. Thank you all for your dedicated service!

Regards,

Jeff Lantz,
Director of Commercial Regulations and Standards

MSC Goes To Hollywood

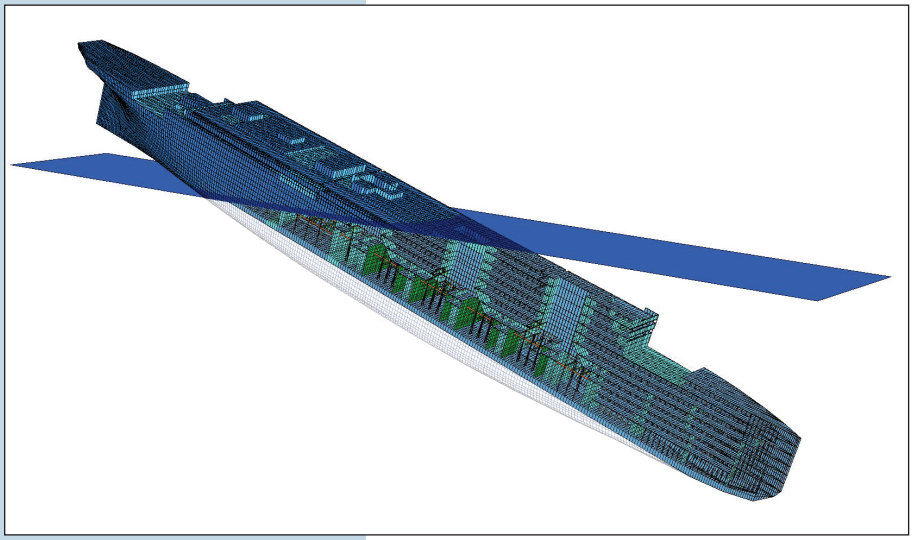
by LT Andrew Lawrence

Brian Thomas on the set of *Titanic: The Final Word with James Cameron*

To mark the hundredth anniversary of the sinking of the RMS Titanic, film producer, writer, and director James Cameron (Aliens, Terminator 2, Titanic, Avatar) assembled a team of eight experts in the making of National Geographic Channel's T.V. special *Titanic: The Final Word with James Cameron.* Among these experts: the Marine Safety Center's Brian Thomas, Assistant Team Leader of the Salvage Engineering Response Team (SERT), a group of highly trained Marine Safety Engineers who help field commanders mitigate emergent vessel casualty situations.

Although only portions of Mr. Thomas' research are highlighted in the television show, his discussion is well supported by a technical research paper presented at the International Marine Forensics Symposium. For the paper, Mr. Thomas and his colleague at the U.S. Naval Academy, CDR Jeff Stettler, used state of the art engineering software tools to analyze the sinking and breakup of the famous passenger liner. Using a detailed General HydroStatics (GHS) model and Bernoulli's equation, they simulated the flow of flood water from compartment to compartment at ten second intervals. This stepwise approach yielded time histories for draft, trim, displacement and hull girder loading. To assess the potential for catastrophic structural failure, the compartment flooding volumes corresponding to the maximum bending moment were analyzed using the finite element software MAESTRO as well as ALPS HULL to estimate ultimate strength.

The integration of these two engineering tools provided interesting results. For instance, small variations in assumed compartment permeability and initial flooding rates had enormous impact on the timeline of the sinking. In contrast, conclusions about maximum bending moment were not very sensitive to these assumptions, consistently indicating that the hull experienced the greatest stresses when it reached approximately 23 degrees of trim. The finite element model indicated that stresses at the top of the superstructure would be far above the tensile yield, but that the ultimate failure likely began with buckling of bottom and double bottom plating.



Finite element model of the Titanic at the time of maximum bending moment

Although their research did not unravel all of Titanic's mysteries, it serves as an important test case for engineering tools that will be used in future casualties. Recent investigations into the sinking of the Deepwater Horizon, Alaska Ranger, and Costa Concordia could all have benefited from the methods used for this research.

Postgraduate Education Season for AY 2013

Do you know an Officer who would be a good candidate for the Marine Engineering, Fire Protection Engineering, Chemical Engineering, or Electrical Power & Controls Engineering Advanced Education Programs? Encourage them to apply and earn their postgraduate degree!

This year, the Marine Engineering Advanced Education program will select 14 officers to attend graduate school to earn a Master of Science degree in a variety of disciplines, including

- Electrical Engineering
- Naval Architecture
- Marine Engineering
- Mechanical Engineering
- Ocean Engineering

Additionally, there will be one person selected for each of the Marine Safety Engineering sub-programs, including:

- Chemical Engineering
- Fire Protection Engineering,
- Electrical Power & Controls Engineering. This program is brand new for this year.

Interested officers may check the following links for more information, or contact the respective program managers:

Marine Engineering, Fire Protection Engineering and Electrical Power & Controls Engineering

ME, EPCE Program Manager: LT Al Giordano

Chemical Engineering Program Manager: LT Beth Newton

FPE Program Manager: LCDR John Miller

OPM-1 Post Graduate Information

Where Are They Now? CAPT Paul Thomas, Director of Prevention Policy (CG-5P)

by LCDR Ron Caputo

CAPT Paul Thomas, Director of Prevention Policy (CG-5P)

MSE: Could you please briefly describe your techie career?

PT: I attended post-graduate school at MIT after which I was assigned to the Marine Safety Center (MSC). After MSC, I decided I wanted as much field experience as possible. As a result, I was assigned to MSD Port Canaveral, and MSO Jacksonville. My first prevention commanding officer position was as an O5 at MSU Galveston with a subsequent tour as Commander, Sector Jacksonville. Of course, my technical background helps me very much in my current position.

MSE: What do you believe techies provide to the Prevention community and what are some significant lessons you've learned since your payback tour?

PT: A technical degree sets techies up with a host of skills that I value tremendously now, and when I was MSU CO and Sector Commander. I've found that there are three qualities that come natural to techies. First, MSEs have a great understanding of conducting inspections and field operations. They tend to be very good Marine Inspectors with a stronger technical understanding of the regulations. Next, when MSEs combine their technical degrees with a Professional Engineer's (PE) license, they earn significant credibility with industry. This is very important in today's environment. Finally, the most important aspect I believe techies obtain from their degree is the approach they take to solving any problem.

It's these attributes that are sought after for senior positions in Prevention, and the Coast Guard. For example, current and past flag officers in Prevention have technical degrees; RADM Cook, RADM Nash, RADM Watson and RADM Gilmour are just a few examples. Clearly, technical degrees are appreciated at the highest level.

MSE: With that in mind, how do you address the perception that becoming a MSE can hurt a junior officer's career, especially a JO without quals?

PT: The program is doing a great job at that and needs to continue addressing it, figuring out each specific situation for MSC and CG-5PS JOs, especially those without Prevention quals. As MSU and Sector CO, I gladly accepted any techie from MSC, knowing that they have the attributes I mentioned earlier. Prevention Department Heads, MSU and Sector COs must recognize, and stress to OPM, that these officers with inherent, proven problem solving skills and strong technical foundation qualify quickly and excel in the field. That is not to imply qualifications are not important, they are critical. But we need and should really value technical experts with field experience; so leadership has to provide those opportunities.

MSE: Do you have any closing thoughts?

PT: The Coast Guard will always need a core of technical experts and being a Marine Safety Engineer as their primary specialty sets officers up well for a successful career.

New MSE Postgraduate Education Program

The Office of Design and Engineering Standards (CG-ENG) is pleased to announce the creation of the "ELECTRICAL POWER SYSTEMS & CONTROLS ENGINEERING" postgraduate school program!

Sponsored by the Marine Safety Engineering community, this is an excellent opportunity for officers with a Bachelor of Science degree in Electrical Engineering to further their knowledge of electrical engineering through both education and practical application. Graduates will be assigned to the Marine Safety Center (MSC) or Coast Guard Headquarters (CG-ENG) where they will hone their skills reviewing complex commercial vessel power systems, Dynamic Positioning Systems, and other electrical equipment for approval by the Coast Guard. The formal solicitation for applicants has been released via the CG Message System.

Contact LT Brian Meadowcroft at (202) 475-3448 or via email to brian.k.meadowcroft@uscg.mil with any questions regarding this new and exciting program.

Hybrid Propulsion: Moving Ahead

by LT Brian Meadowcroft

LT Brian Meadowcroft observing hybrid propulsion operations aboard HORNBLOWER HYBRID

The Environmental Protection Agency (EPA) continues the phase-in of increasingly more stringent Tier 2 and higher emissions standards for equipment aboard marine vessels. New Tier 2 engine standards require electronic controls for fuel injection, cooling, and other systems to reduce emissions from vessel engines. To encourage vessel owners to upgrade their engines, the EPA developed a grant program to help offset the cost of new installations. Some owners have opted to use hybrid propulsion systems that not only meet the emission reduction requirements, but also reduce operating costs by improving fuel efficiency. These hybrid systems allow engines to shut down during times of reduced load, using technology similar to that used in hybrid cars. All commercial vessel propulsion control systems must meet Code of Federal Regulation requirements for Electrical and Marine Engineering. For these and other reasons, the use of environmentally friendly propulsion systems is growing. As a result, Marine Safety Center (MSC) engineers have seen a significant increase in propulsion system plan review in the last year.

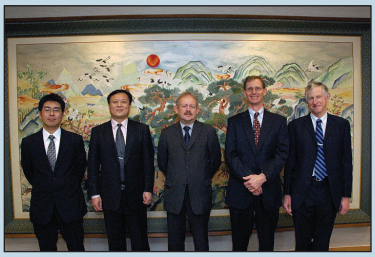
MSC electrical engineers review the required Design Verification and Test Procedure (DVTP) that specifies the methods used to validate various propulsion system failure modes and effects. The DVTP receives final MSC approval only after satisfactory completion of field testing and incorporation of any necessary changes identified by the OCMI. When requested, MSC electrical engineers can provide on-site assistance to local marine inspectors for complex or unique systems. These visits provide an excellent opportunity for staff engineers to see the systems they have reviewed, and for field inspectors to learn more about the increasingly complex systems installed on inspected vessels.

MSC engineers recently conducted a fact-finding visit to LA/LB to learn more about hybrid propulsion systems. While there, they examined a diesel-battery-electric hybrid tug and a passenger vessel preparing for conversion to a similar propulsion system. The lessons learned from this trip were put to use when electrical engineers assisted local inspectors during tests of new propulsion systems aboard two other vessels: the hybrid hydrogen-battery-diesel-electric HORNBLOWER HYBRID in New York and the diesel/DC electric paddlewheel BRANSON BELLE in Branson, MO. Both vessels successfully completed testing and are currently in operation.

Close work between the MSC, field inspectors and vessel designers helps to ensure the approval process for advanced vessel propulsion control systems flows smoothly and that any significant regulatory issues can be addressed during the initial design phase.

New Tonnage Initiatives at IMO

In keeping with a long tradition of U.S. involvement on tonnage measurement matters internationally, the Marine Safety Center (MSC) has assumed a leadership role in the International Maritime Organization's first comprehensive review of the 1969 Tonnage Convention. U.S. harmonization work on systems for assigning gross and net tonnages began with the League of Nations, and culminated in the 1969 Diplomatic Conference that drew up this Convention, presided over by former Commandant Admiral Edwin J. Roland, USCG. While the Convention has served the maritime community well, possible amendments and updates to interpretations are under consideration to keep pace with rapidly evolving ship designs, and to address concerns on how it may influence the size of crew accommodation spaces. As the governmental entity that administers the U.S. Tonnage Program, the MSC continues to coordinate correspondence groups and develop solutions through formal and informal meetings, to ensure the integrity of this vitally important foundation of global maritime regulations.



MSC Tonnage Division Chief Mr. Peter Eareckson (second from right) at a meeting of international tonnage representatives in London

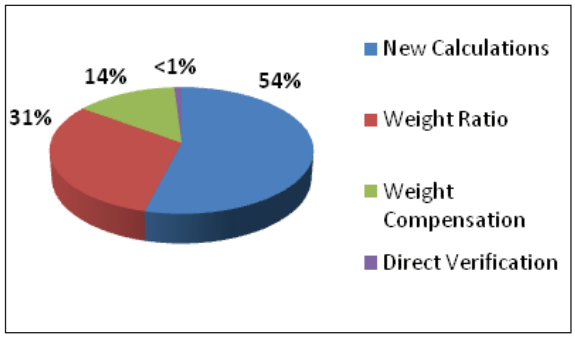
Expanding Waistlines Impact Passenger Vessel Capacity

by LT Jarred Hinton

On December 14, 2010, the Coast Guard formally amended the passenger vessel stability regulations and increased the assumed average weight per person to reflect the reality of America's expanding waistlines. All inspected passenger vessels were required to update their intact and damage stability calculations to demonstrate compliance with the amended regulations. Owners of passenger vessels were provided with four methods to demonstrate compliance with the new standard prior to December 1, 2011:

- Perform new Subchapter S stability calculations (or simplified stability tests);
- Reduce passenger capacity using a ratio of old / new assumed average weight per person;
- Reduce cargo carrying capacity; or
- Verify passenger weight prior to boarding (known as "direct verification").

The Marine Safety Center (MSC) has issued nearly one third of the existing certificated passenger vessel stability letters and, as such, was responsible for verifying compliance with the updated passenger weight standards for nearly 1,800 vessels. The majority of the stability submissions MSC received were fairly straightforward, however a number posed unique engineering challenges. Many stability letters were issued decades ago and, over the years, the original stability calculations had been misplaced. In some cases, the original stability letters provided basic stability information, but did not clearly identify operational limits that the master could use to determine whether loading conditions were within acceptable safety margins. In both cases, MSC engineers worked with vessel owners to piece together bits of old stability information, applied conservative assumptions, and through creative engineering, issued new stability letters with appropriate operational guidance. In other cases, vessels simply had to undergo new stability tests to demonstrate compliance with the updated passenger weight standard.



Distribution of passenger weight stability submissions to the MSC. More than half the vessel owners chose to submit new stability calculations, which involve extensive engineering analysis.

Occasionally, errors were discovered with old stability evaluations or test procedures. MSC's engineers diligently worked to resolve these errors and provide updated stability information for these vessels. Inconsistencies were also identified in the way stability tests were applied to some classes of vessels. MSC worked closely with marine inspectors in the field as well as the Coast Guard Headquarters Office of Vessel Activities to update existing guidance and teamed with Training Center Yorktown to train new inspectors on Simplified Stability Test procedures. Each initiative was designed to promote consistent application of stability standards across the passenger vessel fleet.

Implementation of the revised passenger weight standard has given the Coast Guard a unique opportunity to reevaluate load capacities and ensure all inspected passenger vessels meet applicable stability criteria, thereby enhancing the overall safety of the U.S. passenger vessel fleet.

Coast Guard Engagement at Offshore Technology Conference 2012

On May 2nd, Mr. Jeff Lantz, Director, Commercial Regulations and Standards, addressed the Offshore Technology Conference (OTC) panel titled "Focus on Safety and Spill Response in the Post-Macondo Era." He outlined the Coast Guard's efforts to enhance safety on the Outer Continental Shelf and highlighted several areas of focus, including the need for a uniform safety standard regardless of a drilling rig's flag state, and standards for dynamic positioning systems, "floatels" and large offshore supply vessels. He also announced the availability of Dynamic Positioning Guidance published by the Coast Guard in the Federal Register.

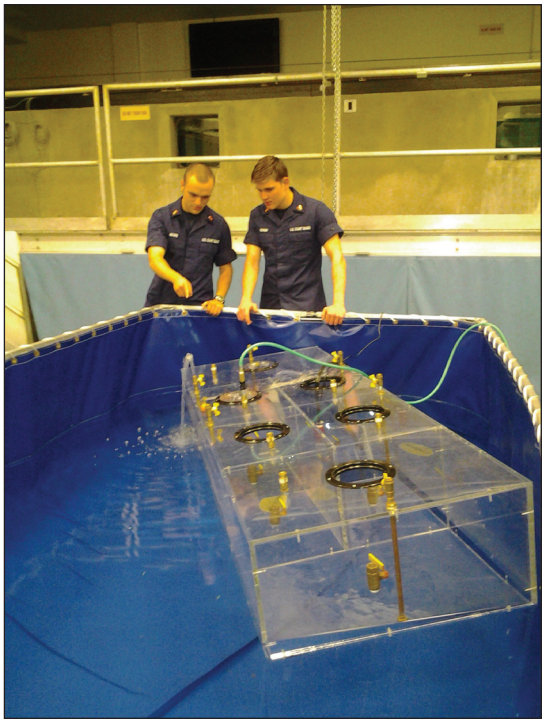
Mr. Lantz presenting at OTC

In addition, Mr. Tim Meyers, a staff engineer in the Office of Design and Engineering Standards, addressed the OTC panel titled "Design Issues and Trends for Offshore Service Vessels" to highlight the Coast Guard efforts to develop safety standards for natural gas fueled ships. He announced the availability of a Coast Guard policy letter outlining safety requirements for gas fueled ship design.

MSE's at CGA: Developing Future CG Engineers

by CDR Matt Edwards

Cadet exposure to Prevention missions and Marine Safety Engineering continues to increase both in and out of the classroom. Thanks to the contributions from the Coast Guard Academy Alumni Association (Class of 1950), the Marine Casualty Response course has incorporated use of a seven-foot acrylic barge, a 1600-gallon tank and various other equipment into the class. The new equipment enables cadets to try out their theoretical salvage procedures for a vessel that has grounded, experienced a loss of stability, or sunk. Armed with "back of the envelope" calculations or, in some instances, a General Hydrostatics (GHS) computer analysis, they use pumps, compressed air and pulleys to execute their plan and see firsthand what works, what does not, and the various challenges associated with marine salvage engineering.



CGA cadets use their new "barge" to learn about vessel salvage techniques

This spring a new Professional Maritime Studies Department course, the Marine Safety Professional, was introduced to the Coast Guard Academy curriculum. Marine Safety Engineers teach this non-technical elective to compliment ongoing efforts to expand cadets' understanding of Prevention missions. With themes of risk management, partnerships and systems thinking, the course introduces cadets to the regulatory process, Sector roles and responsibilities, SOLAS and Port State Control.

New training opportunities have also been added to the cadet summer program. With more Sectors willing to assist with cadet training, a greater number of 2/c cadets are being assigned to a Sector for a week to train under Prevention Officers. The Shiprider program that was implemented for 1/c cadets last summer also continues to grow. Modeled after a program aimed at Apprentice Marine Inspectors, cadets spend 5-6 weeks underway on a commercial vessel such as a bulker or containership. Thanks to the American Waterway Operators support, cadets will also have the opportunity to ride on towing vessels this summer.

This transfer season, CDR(select) Scott Calhoun will be departing the Coast Guard Academy to be the Prevention Department Head at Sector St. Petersburg. LCDR Dan Cost will be CDR Calhoun's replacement. Many thanks to CDR Calhoun for his efforts in building the new Marine Safety programs and curriculum at the Coast Guard Academy. These programs will have an immediate and positive effect on the Marine Safety Engineering Community and will raise the awareness of the Prevention field for a new generation of Coast Guard Officers.

Finally, we always welcome the latest news and technology that Marine Safety Engineers are encountering. As you come across information that you think may be of interest to young engineers, or if you have suggestions for a senior engineering design project that would raise awareness of the Prevention community, please email your thoughts to CDR Matt Edwards at matt.edwards@uscga.edu.

CG-5PS Goes Offshore

Mr. Lantz, along with CAPT John Nadeau (CG-ENG) and CAPT Patrick Little (MSC), recently visited several shipyards, vessels and facilities supporting oil exploration and production on the Outer Continental Shelf.

Joined by CDR Mark McManus and LT Charles Dudek of MSU Morgan City, they toured the THUNDERHAWK, a semi-submersible floating offshore installation moored in 6060 feet of water, and the DEEPWATER PATHINDER, a dynamically positioned drillship working just a few miles away. Additionally, the trio viewed modern shipyard construction techniques at two Houma area shipyards, a high tech training center in Galliano, and modern offshore supply vessels and the supporting logistics infrastructure at Port Fourchon.

The trip provided a valuable perspective on the unique and emerging needs of the offshore industry, and underscored the importance of our standards development and plan review work.

Mr. Lantz on the drillfloor of the DEEPWATER PATHFINDER

Engineer in the Spotlight: Mr. Wayne Lundy

by LT Nick Woessner

Wayne Lundy, P.E., is a senior marine engineer in the Office of Design and Engineering Standards. He is a 1977 graduate of the U.S. Coast Guard Academy with a degree in Civil Engineering and a 1983 graduate of the University of Michigan with a degree in Naval Architecture and Marine Engineering. With over 20 years of experience in marine engineering, he has led numerous initiatives that span a wide breadth of issues including the development of design standards for marine pollution prevention equipment, pressure vessels, and ship design.

Mr. Wayne Lundy (right) recieving the ASME Dedicated Service Award

He is a long-standing member of the U.S. delegation to the International Maritime Organization's Marine Environment Protection Committee and the Maritime Safety Committee, as well as a number of related subcommittees. Recently, his focus has been on developing a code for ships operating in polar waters, and he has championed the international wash-water standards associated with exhaust gas cleaning systems. His consistent and reasoned voice has instilled clarity and organization to complex and sometimes politically contentious issues. His professionalism has facilitated both interagency and international cooperation on the development of international standards.

Wayne Lundy is an active member of the American Society of Mechanical Engineers (ASME). His diligent work contributed to the advancement of numerous standards, with an emphasis on pressure containment systems for marine applications. He was recognized from more than 1,500 ASME volunteers by the ASME leadership for his outstanding contributions and received the ASME 2011 Dedicated Service Award for "honor of unusual dedicated voluntary service, outstanding performance, effective leadership, prolonged and committed service, devotion, enthusiasm, and faithfulness."

Through his comprehensive engineering experience and firm grasp of the standards and regulatory development process, Wayne Lundy has made significant contributions to maritime safety.

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

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(202) 372-1362