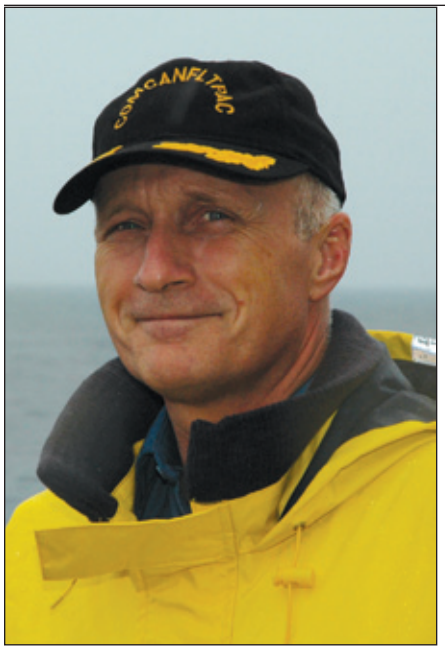

Safer seas…aiming for greater competence.

By Nigel S. Greenwood
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This article will examine the evolution of maritime training and certification schemes to show how recent efforts to improve the competence of mariners will provide for a safer carriage of both precious and dangerous cargoes.

"We have a problem…" (?)

In the past few years a number of marine accidents have, rightly or wrongly, focused public attention on the competence of professional mariners. Here in the Pacific Northwest, it is easy to see why this is a topic of common concern: each summer season the B.C. coast is host to about 1.3 million cruising travellers as approximately 30 of the world's largest cruise ships sail our waters. And the current climate of popular debate surrounding the prospect of exporting oil through the Pacific Gateway is focused on the dire environmental effects should a tanker go aground on the north coast.

Indeed, much of the discussion presumes, to a large degree, that accident is the inevitable consequence of unavoidable human error. In this matter, statistical study sides with intuition; a 2012 report by the Standard Group of maritime insurers found that of 85 claims over $1M in the previous five years, more than 50 per cent were caused by watch-keeper fault rather than technical failures. Many publicly prominent examples — *Exxon Valdes, Queen of the North, Costa Concordia* — seem to bear this out.

But even if the implicit premise of human fallibility is accepted, one need not accept as a corollary that nothing can be done. In fact, in maritime jurisdictions around the world, talented professionals are examining the record to determine if the causes can be more specifically categorized as negligence, ignorance (unfamiliarity, perhaps) or lack of skill. Leading from this study, a great deal of effort is underway in many Maritime Education and Training (MET) institutions to constantly improve training. The goal is greater competence and not just certified knowledge.

This article will examine the evolution of maritime training and certification schemes to show how recent efforts to improve the competence of mariners will provide for a safer carriage of both precious and dangerous cargoes.

From apprenticeship to production line

Traditionally, the production of seamen officers was a lengthy and arduous process. The standard recipe was to take a male child of impressionable age (12-16) and subject them to the primal rigours of the midshipmen's gunroom or the apprentice's half-deck. Those who survived the violence of the enemy or the weather (or even their shipmates) would learn some boat-work and navigation between punitive trips to the masthead. After two to six years, further self-study, cramming schools and finally written and oral examinations, they would be certified as Lieutenant or Second Mate. This process yielded qualified junior officers with significant sea experience by the time of their 18th birthdays.

Photo source: www.gcaptain.com

How does this happen? The M/V Springbo & M/T Gas Roman on approach to the mega-port of Singapore in 2003.

Today, there are over 145 recognized maritime colleges in the world. Of these, 35 are in the Philippines, reflecting the increasing representation of that nation in producing the world's professional seafarers.

The process of examination was itself in some cases quite subjective. Standard texts, while containing an uncommon degree of mathematical detail, favoured rote learning: standard questions accompanied by stock answers to be memorized. The oral examination which concluded the process was a torturous rite of passage: Joseph Conrad wrote of his own experience in these terms: "It lasted for hours, for hours…And still the passionless process went on…'This ancient person,' I said to myself, terrified, 'is so near his grave he must have lost all sense of time'…He began by trying to make me talk nonsense."

In the mid-19th century, the growth of maritime trade created a need for more deliberate means of producing reliably-trained officers. Competing maritime interests in London and Liverpool founded floating schools such as the training ships *HMS Conway* and *HMS Worcester* to feed the officer ranks of the merchant marine and the Royal Naval Reserve. Similar initiatives were undertaken in other countries. Over time, most of these schools migrated ashore to "stone frigates" and became more formalized as centres of post-secondary education in their specific technical-operational domain.

Today, there are over 145 recognized maritime colleges in the world. Of these, 35 are in the Philippines, reflecting the increasing representation of that nation in producing the world's professional seafarers. Many nautical colleges are in fact full-fledged polytechnic universities, offering undergraduate and post-graduate degree programs as well as cadet-training schemes leading to certification. At the high end of maritime training agencies is the World Maritime University in Malmo, Sweden. It offers exclusively post-graduate degrees and diplomas at MSc/PhD levels in Maritime Law, Logistics, Education, Environment, Management and other related academic disciplines.

The problem of marrying sophisticated technical knowledge with practical competence leads many nautical colleges/academies to offer a co-op program. California Maritime Academy's (CMA) template is representative of mid-sized, well-founded maritime colleges in the developed world. CMA's body of 300 deck-officer cadets is assembled from an annual intake of about 90. Over a four-year course leading to a BSc in Marine Transportation, the cadets undertake summer cruises, both in the academy's 500-ft training ship *Golden Bear* and with commercial shipping partners. This allows them to accumulate sufficient sea-time to attempt the US Coast Guard certification examination for Third Mate before their academic graduation. Canadian maritime colleges such as Memorial University's Marine Institute in St John's (MUN-MI), or BCIT's Marine Campus in North Vancouver, use comparable models of officer development. The stringency of this combined academic/practical challenge is indicated by a 25-30 per cent attrition between joining and certification, a loss rate common to all similar training establishments.

Photo source: www.shipspotting.com

The modern training-ship: California Maritime Academy's TS Golden Bear.

Standardization…safe for whose waters?

With the early 20th century adoption of measures to improve the safety of ships and seafarers, it was not long before the idea of standardized training and certification was raised. Among the objectives of the International Maritime Consultative Organization (established in 1948, now the IMO) was the goal "to encourage and facilitate the general adoption of the highest practicable standards in matters concerning maritime safety, efficiency of navigation and prevention and control of marine pollution from ships".

The IMO's first Convention on the Standards for Training and Certification of Watch-keepers (STCW) was agreed in 1978, followed by amendments in 1995 and, most recently, in 2010. While the earliest STCW convention had established a more consistent basis for reciprocal recognition and equivalence of Masters' and Mates' qualifications, the 1995 amendments added technical rigour and improved the IMO's capability to force compliance. This compliance usually took the form of coercion by shame of exclusion from the "White List" of fully compliant nations, and more frequently targeted port inspections. The 2010 (Manila) amendments further updated the Convention with respect to modern navigational equipment, advanced

learning methods (e.g., web-based training), hours of work/rest, substance abuse, special requirements for tanker and LNG crews, and polar operations, among other changes.

An outcome of the increasing international collaboration and growing bureaucratic strength of the IMO has been the development of "model courses". These documents, 63 of which have been published under IMO imprimatur, detail recommended syllabi for a number of watch-keeping activities or specialist employments under the purview of STCW. Among those published, but under review to accord with the Manila Amendments, are those dealing with Master, Chief Mate, and Officer in Charge of the Navigational Watch (OICNW). Of course, these model courses are for voluntary adoption by interested parties, not formally prescribed; each national maritime administration is responsible to audit and approve, within their jurisdiction, nautical courses taught to nationally-adopted (STCW-compliant) certification regulations.

All of this sounds quite impressive in terms of structure, best-practice collaboration and co-operative development. However, it is not fool-proof, or rather: fraud-proof. A 2001 report commissioned by the IMO polled 97 maritime administrations, of whom 56 responded. Of these, 82 per cent reported instances of forgery of certificates in the previous five years with an astounding 12,000 cases out of 12,635 being reported by a single maritime administration! An indication of the continuing scope of the problem is found in the 2010 IMO report on this subject which details 48 pages of reported fraudulent certificates in 2009.

Clearly, there is always a degree of incentive which attaches to a seemingly quick route around a lengthy and demanding process. A more insidious risk is that the training meets the letter of the IMO standard, yet comes nowhere near assuring the competence to conduct a watch in a busy seaway, potentially under challenging meteorological conditions. The term "diploma mill" is commonly used to describe such "least-compliance" approaches, some of which teach strictly to the multiple-choice exams. But many others are looking to meet or roundly exceed convention standards. The more conscientious, leading maritime educational institutions are now making advanced use of "virtual reality" techniques to conduct real "performance checks" on their certification candidates.

Almost as good as the real thing... or perhaps better!

Simulation has been available to the maritime industry almost as long as radar has been in common usage at sea. Here in Canada, both the Royal Canadian Navy and Canadian Coast Guard employed radar simulators for "Blind Pilotage" and collision avoidance practice by the mid-1970s. Sure,

the effects were rudimentary (the steel gash bucket clanging down the hallway was not a signal that you'd forgotten to take the garbage out) but the advantage was that the exercise could be pursued beyond the point of prudent recovery in order to make the (failed) lesson clear. In the Navy, the combination of radar and sonar inputs to a fully mocked-up Operations Room enabled the development of truly complex scenarios for large watch-team development and assessment.

The rapid development of computing and audio-visual technology in the 1980s quickly led to the propagation of much more advanced simulators throughout the aeronautical and maritime worlds. Using a variety of methods, including both projection and use of flat-panel plasma displays, a very realistic bridge with 220 or even up to 360-degree visibility could be replicated. Early efforts to generate (properly uncomfortable) sea-going realism included the use of aeronautical simulator platforms for a "full motion" experience. With increasing computing power and visual fidelity, this is not now strictly necessary; on a fixed base with a visual horizon which moves to reflect ship heave, roll, pitch, yaw, sway and surge, those with weak stomachs are quickly identified! Ship movement due to manoeuvres, wind/ sea and swell, or even collision, are well-modelled through complex hydrodynamic algorithms.

The sophistication of marine simulators was both enabled and driven by the increasing technology on ships' bridges. The profusion of Automated Radar Plotting Aids (ARPA) in the 1980s and Electronic Chart Display and Information Systems (ECDIS) in the 1990s meant that more training had to be focused on developing familiarity with myriad equipment functions. Marine simulators became the right place both to teach the "button-ology" but also to subject certification candidates to real-time pressures of combined navigational and collision-avoidance risks. Lately, with ARPA/ ECDIS displays, which are increasingly software controlled (i.e., not constrained by physical controls on the cabinet), simulation has gone one step further. Different displays within the bridge module can now be reconfigured to "emulate" the specific radar/ARPA sets fitted to the particular ship-model in use.

A large measure of this simulation capability can now also be taken to the desk-top. At each station of the RCN's "Naval Part Task Trainer" (NPTT), the student faces two large flat-panel monitors and a laptop. On one display, the candidate sees the view from the bridge windows and a readily-reconfigurable selection of steering/throttle and bridge controls. On the other flat-panel, she sees the radar/ARPA display and controls. And on the laptop is shown the associated ECDIS display. All of these are linked to allow students to follow a programmed course in navigational/ collision-avoidance problems of increasing complexity or to work in their own time for greater

familiarity with the functions of the bridge systems.

The role of simulation is now well-established and almost indispensible to the development of watch-keeping competence. In fact, California Maritime Academy blends simulation and reality to an unusual degree: onboard their training ship *Golden Bear*, they have a fully outfitted navigational lab and simulator. This re-affirms that developing competence is not only about logging "time on the plates" but requires careful objective observation and mentoring through constructive challenges.

Specialist training *and* development

To this point, we have been covering the route to initial certification. Simulation also plays a critical role in continuing proficiency training, vessel familiarity training, and development of advanced manoeuvring practices.

Navies, with special requirements for ship-handling in company, move beyond single-bridge mentoring. At the RCN's NABS (Naval Advanced Bridge Simulator) in Victoria, six separate bridge modules can be run either independently or in a "linked" status in the same database. This enables fleet manoeuvres to be exercised in a way that is not only subject to the rapidity of changes to the ordered formation — or the whims of the instructor — but also dependent on the sometimes unpredictable responses of the other participating ships (now that's reality!).

Simulation can also be tailored to specific needs. For example, pilot-apprentices and masters from around the world have, since the 1980s, made use of the relatively low-tech but still enormously instructive manned models at Port Revel in Grenoble, France. Here, the "simulation" is as real as it gets: the 10 floating model ships in inventory are carefully scaled and can be configured to replicate the tonnage, controls and powering arrangements of 20 different cruise ships, tankers, LNG carriers and container ships from 38,000 to 400,000 dwt. Added to this are four tug models which represent the range of powers and capabilities available in the world's major ports.

Photo credit: BC Shipping News

Almost as good as the real thing...Kongsberg's Simulation Centre at the BCIT Marine Campus in North Vancouver.

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BC Coast Pilots' apprentices use Port Revel as well as similar facilities in the UK and Poland but also regularly attend computer-simulation training. One institute which specializes in pilot training, among other programs, is the Maritime Institute of Technology and Graduate Studies/ Pacific Maritime Institute (MITGS-PMI) in Seattle. This facility offers linked tug (two) and escorted vessel bridge modules such that pilots can practice their manoeuvres with qualified and experienced tugmasters handling the escorts.

A similar capability exists in North Vancouver at BCIT's Marine Campus simulator. LANTEC Marine Inc., who have provided simulator operation and mentorship in the RCN's east-coast simulator for the past 15 years, is using this system in co-operation with Seaspan Ferries, Seaspan Marine, and SMIT Marine Canada to blur the distinctions between training and port development. Their work with prospective masters helps to develop confidence and skill in ship-handling when career employment might not have afforded the opportunity to do this for real before assuming command responsibility. A side-benefit is the inculcation of a spirit of life-long learning and mentorship, so that Masters will actively nurture command potential in their subordinates.

Where this extends into experimentation and development is a project in co-operation with BC Coast Pilots and Port Metro Vancouver. In this case, LANTEC has applied the best available expertise to safely explore the bounds of vessel management in this tight harbour. Using experienced tug masters and BC Coast Pilots, they have been able to determine the best tether-lengths and responsive manoeuvres as a matter of observed fact and not just subjective evidence. This work has been crucial in demonstrating the safety of handling larger ships with closer lateral and under-keel clearances.

Globalized professionalism

Clearly, maritime training does not end with certification, either at the Mate or Master level. More and more, the maritime industry is embracing continuing proficiency training and

...shipping companies all over the world are developing programs to ensure that their certified crews are fit for purpose.

education, in addition to the statutory requirements for periodic licence renewal. While the IMO represents the forum for agreement on international conventions, other bodies, such as the Nautical Institute, are representative of the effort to constitute a professional "college" representing highest ideals of competence, education and ethical practice in the maritime domain. Indeed, these hallmarks of a profession underline that the vocation of a shipmaster is not just a trade.

Individually, shipping companies all over the world are developing programs to ensure that their certified crews are fit for purpose. Some of these are world-class in their potential to enhance not only their own operations but also to contribute to the globalized professionalism of the maritime industry. One such example close to home is the BC Ferries' Standardized Education and Assessment (SEA) program. The SEA program is a web-based online system which leads each new employee, or those stepping up a level of certification and employment, through a graduated program including fleet-wide fundamentals, specific vessel and route familiarization, onboard job shadowing and multi-modal assessment to obtain "clearance" for a given position and ship. BC Ferries SEA Trainers have access to the full suite of SEA resources through their trainer accounts. The system is also partially accessible to all non-trainers and the general public (see http://learning.bcferries.com). The system includes a career progression component aimed at supporting the development of employees to their next level within the company. SEA is also dovetailed with two other training initiatives of BCF: the BCF Academy, which provides training resources and support to individuals and teams, and BOSS (Bridge Operations Skills and Systems), which provides BCF-specific training and assessment for whole bridge teams, using BCF's three visual bridge simulators. Jeff Joyce, BCF's Director of Fleet Operations and formerly the Director of Operational Training, acknowledges that while SEA has been under development for some time, the *Queen of the North* sinking added more urgent incentive to have a well-founded, repeatable and auditable system of developing and maintaining crew competence.

A Vancouver company, Marine Learning Systems has been a key collaborator with BCF in the design and development of SEA as a world-class company-level training system. Its wider applicability is obvious and has already generated considerable interest. MLS' President and CEO Murray Goldberg has also provided an additional service which is openly accessible to mariners: www.maritimementors.com applies the protocols of an "academic social site" to the problem of matching developing mariners with suitable mentors. Applicants can specify their certificate level, ship type, trading route and other specifics to find an appropriate match to advise them on professional challenges or career paths.

A number of other organizations and initiatives speak to the desire to raise the lowest common denominator of maritime training. The International Association of Maritime Universities (IAMU) includes 53 high-end nautical colleges and academies among its members, all of whom pledge cooperation toward the common goal of developing a "standardized Undergraduate Curricula and an International Certification System for Competency". Another such organization is the Global Maritime Education and Training Association (GlobalMET) which was formed in 1995 to pursue similar objectives. GlobalMET currently collates the efforts of 18 MET institutions in the Asia-Pacific region. A recent addition to the list of organizations activating for more competence-based training in the maritime domain is Project Sea Drive. This is a global discussion group of active mariners and educational professionals, largely members of the Nautical Institute, who see some urgency to the need to rid the seas of those who may still obtain their tickets through "diploma mills."

Conclusion

The history of maritime education and certification has been one of constant evolution and improvement. While ships continue to run into each other and charted navigational dangers, it appears that further improvement is still necessary. That this is happening, not just here but all over the world, is good news. Indeed, advanced techniques make competence-based education and training ever more accessible.

The better news, perhaps, is that both the need and the solution have considerable traction here in the Pacific Northwest. With greater, continued attention to the issue of competence at the beginning and throughout a nautical career, we are in a better place to acknowledge that the risk to our environment here on the coast is finite, but manageable.

Nigel Greenwood is a retired Rear Admiral of the RCN. He consults at GreenwoodMaritime.com and is a part-time mentor in the RCN's navigation simulator in Victoria. He is an Executive Director with Project Sea Drive.

Notable industry leaders scheduled to speak at the Nautical Institute Conference

The Nautical Institute (BC Branch) is pleased to announce the following speakers as confirmed for the NIBC 2013 Conference:

Stephen Payne, PhD, OBE, FRINA

Dr. Payne was formerly the VP/Chief Naval Architect with Carnival Corporate Shipbuilding.During his career he has been responsible for many cruise ship innovations. He was the Designer and Director of Project Management for Cunard's flagship *Queen Mary 2*. He is the keynote speaker and will address the conference on Passenger Vessel Safety generally, as well as speaking to the *Queen Mary 2* project

David K. Jones

Mr. Jones is a partner with Bernard & Partners, Barristers and Solicitors. His legal practices focus on maritime issues and he frequently writes for *BC Shipping News* on such matters. He will speak on the "History of Passenger Vessel Misadventures from *Titanic* to *Costa Concordia*"

John Dickinson

Mr. Dickinson has been the Nautical Institute's Head of Delegation to the IMO for the past three years. Previously he was the Manager of [Maritime] Licensing in New Zealand. He will speak to " IMO and SOLAS; What it has done for Passenger Vessel Safety?"

John Hicks

Mr. Hicks is the Vice President of Lloyd's Register Passenger Ships Group. A Naval Architect, he was previously the Principal Surveyor, Passenger Safety with Lloyd's. He will address: "Class Society Contribution to Passenger Vessel Safety"

Bruce Paterson

Mr. Paterson is the Fleet Technical Director, BC Ferries. He will address "Naval Architecture — How Designs are Changing in the Future"

Trevor Bailey

Mr. Bailey is the Managing Director of Seatag Safety Systems, which produces award-winning mobile solutions to achieve fast, accurate accountability for personnel during an emergency. He will speak to "Accountability Start to Finish"

Captain John Wright, FNI

Captain Wright is the Managing Director of Wrightway Training Ltd., whose clients include Carnival Corporation and BC Ferries. He will speak to "SailSafe — A collaborative workforce management system"

Doug Houghton

Mr. Houghton is the President of Current Corporation which manufactures advanced day and night-vision camera systems for marine surveillance applications worldwide. Current Corporation is the NIBC Conference's Platinum Sponsor. He will speak to the safety applications of his systems.

Elizabeth Steele

Ms. Steele is the Operations and Marketing Manager for the popular Victoria-based whale-watching company, Prince of Whales. She will use her specialist expertise to address the safety issues of "Small Open Passenger Vessels"

Panel session

Issues of major ferry operators will be covered by a panel of regional experts addressing the question "How do mass passenger ferries deal with safety?":

- **Captain Jamie Marshall**, Vice President Operations, BC Ferries
- **Captain George Capacci**, Deputy Chief Operations and Construction, Washington State Ferries
- **Captain Elmer Grasser**, Port Captain Black Ball Line (MV Coho)

Beth Gedney

Ms. Gedney is the Director Safety, Security and Risk Management, for the Passenger Vessel Association, a Virginia-based organization whose diverse membership carries 200 million passengers per year. She will address the harbour and dinner-cruise sector of the industry.

Captain Michael Inman

Captain Inman USCG (Ret'd) is VP Safety and Environmental Management Systems, Holland America Line/ Seabourn. He will take a look forward to new and improved safety and passenger control in large passenger vessels.

Rear Admiral Bill Truelove, OMM, CD

Rear Admiral Truelove is the Commander Maritime Forces Pacific. In this role he is responsible for command of maritime SAR activities in his region from Washington to Alaska. He will speak to the Regional SAR Commanders perspective on mass-casualty preparedness in this area.

The conference chairmen

- **Captain David (Duke) Snider, FNI**, is a Vice President of the Nautical Institute, and is the Regional Director Fleet, Western Region, Canadian Coast Guard.
- **Captain Chris Frappell, MNI**, is NIBC's Chairman, and a Marine Superintendant with BC Ferries
- **Rear Admiral Nigel Greenwood, RCN (Ret'd), MNI** is a consultant with Greenwood Maritime Solutions Ltd.

Registration details

This year's Nautical Institute (BC Branch) Conference focuses on: *Passenger Vessel Safety: What is the industry doing to ensure continuous improvement?*

The conference takes place on May 9 and 10, 2013 at the Marriott Inner Harbour in downtown Victoria, B.C.

To register, please visit: www.nibc-conference2013.com.