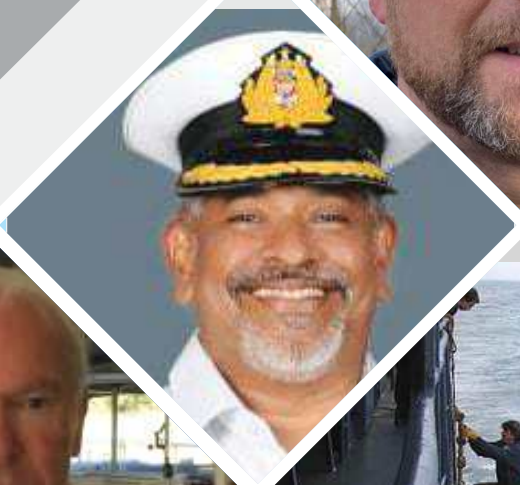
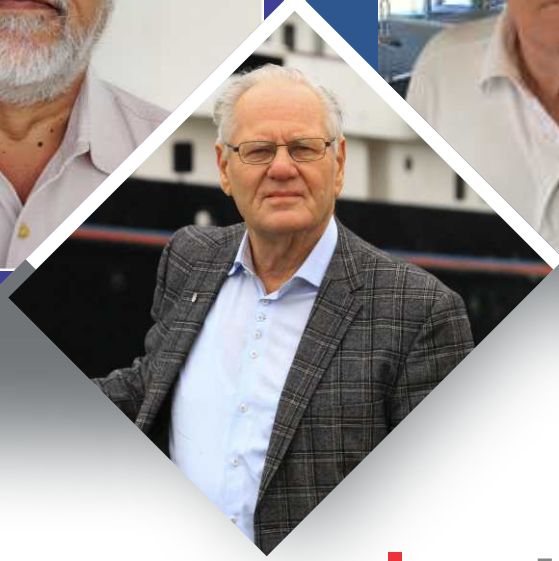
All India Maritime Pilots' Association



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From The President's desk

Capt. Gajanan Karanjikar
President- AIMPA

Dear well-Wishers

Greeting of the new year and hope this new year would be a normal. The new normal has already began and most of the people have reported back to work. Wish them all very happy work weeks and safe work place in the new normal precautions.

On pilotage front, the business as usual. Few of the Pilots have reported on non-compliant ladders. Respective authorities were made aware the matter and appropriate actions were taken. We are happy that the pilot ladders are taken seriously now and things are changing. About 10 pilots have reported that most ladders are non-compliant and that 'most' figures swells to 60%. DGS has again been urged to start the focused inspection on all ships visiting all Indian ports. MOU's CC (concentrated campaigns) agendas are full and pre decided till 2024 without having considered these no-compliant and dangerous ladders.

On training needs for our pilots, there is lot still to be done. Things are in progress. Let's see. But making Pilots aware that they need to be trained is very important and we think it needs a very structured approach. We will keep you posted on this from time to time.

This month's issue is special and talks about a very important aspect of Maximising situational awareness in Pilotage. It is very engaging. Another article is about the Mental model in BRM.Bridge Resource Management is founded on **sharing mental models**. What does this mean when navigating and manoeuvring in confined waters? Is the level of information exchanged on the bridge detailed enough to enable unambiguous and timely challenge and response?

Advertising is not in the policy of this journal. Not yet till such time we become a circulation of a repute. But onspecial request from Capt Henk Hensen who wrote the very useful book,**TUG USE IN PORT** we are printing its review on the occasion of the newer edition being published in Rotterdam.Since the second edition was published, the world of port towage has undergone a revolution, with many new and innovative designs now in operation. Consequently, in this third edition, supported by the Rotterdam pilots, Captain Hensen has rewritten the text in order to provide comprehensive details of all tug designs, their operational parameters and the optimum positioning to maximise their effectiveness.

We all at AIMPA, wish you all a very happy new year 2021, with safe and sound health.

Capt Gajanan Karanjikar
President- AIMPA
All India Maritime Pilots Association
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Pilot personality of the month

Capt Sajan Verghese

Capt. Sajan K Verghese joined Cochin Port as a Pilot after 15 years at sea. He was the editor of the magazine "Varuna 2020" for Mariners Society, Kochi. He is a Member of the Managing Committee of the Cochin Merchant Navy Club, past Secretary CMMI - Cochin Branch, past President of the Cochin Port Master Mariner's Association, Vice President - AIMPA, a Fellow of CMMI and an AFNI.

The sailing direction volumes used on board are still known as “Pilots”. Pilotage is one of the oldest professions in the world. Capt. Verghese was very fascinated by the ship manoeuvring skills of many pilots around the world. He observed that most of them were cool while doing their job, which they did well. Due to personal reasons, Capt. Verghese had to leave sea life in 1998. The first opening ashore he received was from Cochin Port Trust and, without batting an eye, he grabbed it.

Capt. Verghese is in no doubt that pilotage is a tough job and which is both mentally and physically demanding. “The long ladders, uneven hours and never-ending decks on mainline container ships can exhaust even the toughest. But when you do a job well, you know for yourself that you have done so. The Captain's expression of gratitude and admiration gives one even better feeling of satisfaction. What I find the most satisfying is that one never takes the job home. Once you are home with family you are a free man”, remarks Capt. Verghese.

In his career spanning nearly 22 years, Capt. Verghese trained many Pilots in ship handling and etiquettes in integrity, honesty and being a gentleman. He is proud to affirm that the Cochin Port pilots are some of the best professionals in India. “Such high professional standards is a legacy handed down by our seniors”, says Capt. Verghese. The opportunity to work in Cochin shipyard doing docking, undocking, handling aircraft carriers, rigs etc gives pilots at Cochin Port very good experience. Being a tidal port, Cochin is able to meet the needs of deep-draft mainline container ships. SPM and LNG vessels frequenting the port adds on to its pilots' experience. The Indian Navy and Coast Guard also use the port's pilots for their vessels that call at Cochin.

Capt. Verghese adds that piloting is more art and skill than science. Of course one must read many books and get enough knowledge on handling various ships and tugs etc. But eventually the art is like that of the conductor of a symphony. The orders given should be clear, loud and simple which can be easily understood by the bridge team, tug master, mooring crew, wharf superintendent, Port control etc. If one knows how to use the available resources in the proper way, one's manoeuvring becomes a melodious symphony and will be a delight for those who watch. All the people who work with you will look forward for your next movement.

We are most pleased to convey Capt. Verghese's best wishes to all the Marine Pilots at various ports in India, and that they enjoy their job and strive to make it better every day.

Capt Paul Stanley

Capt Paul Stanley was a navigation specialist in the Royal Navy before migrating to New Zealand in 1985 and joining the RNZN.

He had particular interest in pilotage and ship-handling and especially in teaching others. After leaving the Navy in 1998 he started developing PPUs and was the founding Managing Director of Navicom Dynamics - now the world's leading specialist PPU manufacturer.

He is now largely retired and living in Marlborough New Zealand - close to the sea but surrounded by mountains and vineyards. Although he no longer has a direct relationship with Navicom, he maintains an active interest in pilotage and particularly PPUs.

Maximising Situational Awareness in Pilotage

Increasing accuracy and safety in all conditions by the use of PPUs

Paul Stanley, FNI

Although pilotage has traditionally been conducted visually, ships frequently need to be piloted in conditions where vision is impaired by environmental conditions. In such cases a pilot's situational awareness may beheavily compromised unless other information sources are used effectively. We all recognise 'restricted visibility', in conditions of fogetc, and change to other pilotage methods, but the most common cause of reduced situational awareness that pilots face isimpaired vision due to darkness.

As Captain John Clarke described very comprehensively in the June edition of Seaways, not only are many of the familiar visual cues absent altogether at night, but the human eye is also extremely inefficient in the dark - compounding the problem.

A major improvement to situational awareness can be achieved through use of a good quality Portable Pilot Unit (PPU). Although PPUs have been in use for over 20 years, and many pilots have one available, we continue to see instances where ships have run aground, or had near misses,when proper use of a suitable PPU could have been a major help in preventing the errors that led to the ship being in an unsafe position.

This article will identify how increased use of PPUs can compensate for loss of visual information by night and day;it will also explore how PPU use canalso improve the accuracy and safety of pilotage in all conditions.

Incidents during night pilotage

Some incidents which have involved loss of situational awareness at night are very well-known, such as:

- *CMA CGM* Vasco de Gama, a 399 m container ship, which grounded while turning into Southampton water at night. There were two pilots on board, witha high quality PPU and two good ECDIS displays, but none of the displays showed a suitable planned track for the turn in the prevailing conditions, making it very

difficult to effectively monitor the turn. Having just passed an outbound ship, she was too far North when she started her turn to Starboard, turning out of wind with limited under-keel clearance; consequently the rate of turn (ROT) reduced, and she grounded on the West side of the Thorn Channel.

(UK MAIB report 23/2017)

Less well-known examples include two from Australia/New Zealand:

- *Leda Maersk,* a 266 m container ship, grounded after turning too sharply while negotiating a bend in the Otago Harbour at night. The ship was being navigated visually; a cross-track alarm from the ship's ECDIS was not notified to the Master and Pilot; the pilot had a PPU but he was not trained in its use and it was not properly set upso he chose to ignore it. (NZ TAIC report MO-2018-203)
- *Aquadiva,* a 292 m bulk carrier, was leaving Newcastle, fully-loaded, at night with four tugs. As she approached the 'Horse Shoe' turn (about 90°) Port rudder was applied but 'too little, too late'. The pilot, concentrating on the ROT indicator, belatedly recognised that the ship was much further South than intended. Withthe aid of multiple tugs, the drift to the South was arrested with the ship well outside the fairway and possibly touching the bottom.The pilot had elected not to take a PPU with him on this job, despite the size of the ship, and was navigating primarily by visual means.

(ATSB-330-MO-2017-002)

Common feature sidentified in the relevant investigation reports for all these incidents include lack of a shared passage plan/mental model, failure to use available electronic aids effectively, and failures of Bridge Resource Management (BRM). Ravi Nijjer, of Marine Consultancy Group Australia, a major advocate and trainer for BRM, commented in relation to these and other pilotage incidents: "Evidence indicates that most of them show over reliance on visual navigation, local knowledge and pilot's intuition, and that a PPU wasn't used even though one was available".

Thee xamples quoted above were deliberately chosen because they happened at night. As John Clarke noted, commercial airline pilots require instrument ratings for flying at night, but night pilotage is rarely treated as a special case and even the largest ships' arrival and departure times are often determined only by the tidal window available.

How can pilots manage the hazards?

Electronic pilotage techniques are a major aid to night pilotage. To be effective, though, the plan shown on the ship's ECDIS and ARPA must be the same as the pilot is working to - which means the pilot's plan needs to be communicated to the ship well in advance of the arrival/departure: providing the plan during the MPX isfar too late! Thisis also true, of course,for daylight passages.

Unfortunately, even with a common plan and a shared mental model, it is all too common for the pilot to receive very limited support from the rest of the bridge team. Consequently pilots become potentially a single point of failure and need to maximise their own ability to monitor

Figure 1: Turn into Thorn Channel

the passage by alternative means. One of the most effective ways of doing this is to use a PPU.

PPUs

Most portable electronic aids for pilotage, whatever their overall level of sophistication, are referred to as PPUs, but for the purposes of this article only high-level units with independent position, and at least semi-independent heading and ROT, will be considered. So-called 'PPUs' which derive own-ship position from the Pilot Plug are specifically excluded and the International Maritime Pilots Association (IMPA) cautions strongly against using them, not least because data derived from the pilot plugis not independent and will, at best, merely duplicate any errors from the ship'ssensors.

(http://www.impahq.org/admin/resources/guidelines.pdf)

For pilotage, one of the most valuable inputs into an electronic charting system is accurate ROT, with software that is able to use it in conjunction with position, and course/speed over the ground to predict future positions when turning. High-level PPUs all have this ability, whereas not all ECDIS systems do (and some older ships' gyros do not even generate ROT anyway). In each of the earlier examples of groundings, a PPU would have given early indication that all was not well; in the cases of CMA CGM Vasco de Gama and Leda Maersk, they did just that, but it seems no one was paying attention to them.

For comparison with the CMA CGM Vasco de Gama incident report, Figure 1 is a screen shot from a recording made by the author in 2006,during a PPU demonstration. It shows a 347 m container ship rounding the Brambles Bank into Thorn Channel; although the track shown was not in use at the time of the recording, but was added later by the author to illustrate this point, the display shows the mid-point of the ship is 8 m to starboard of track, and predicts that if nothing changes she will complete the turn in about 3 minutes -safely but slightly to port of track, so the pilot should increase the ROT if possible.

Familiarity Breeds -Competence

PPU use on every ship is becoming the norm in many ports. Whenever using a PPU, its operation needs to be second nature: it is dangerous for the pilot to be fiddling around with the equipment at critical junctures. After initial training, it is using the PPU on a regular basis - on every trip - that builds the necessary familiarity and competence.

Using the PPU on every trip also serves to build the pilot's confidence in the performance of the equipment - knowing its reliability and accuracy. Having the PPU at the conning position also gives the pilot instant access to accurate heading and speed without having to ask, and shows present and future positions on the chart without having to leave the preferred position. Subsequently, PPUs give pilots the potential to review individual jobs while they are fresh in the memory, and that is invaluable in terms of improving performance. Indeed, the Cambridge Handbook of Expertise and Expert Performance concludes that superior performance comes from deliberate practice and regularly obtaining accurate feedback. The PPU provides that accurate feedback.

Precedence of PPU Info

When the PPU is used forevery pilotage, it becomes the one constant factor which doesn't vary from ship to ship: it is the same familiar equipment, operating in the same way

- by day or night,
- whatever the visibility,
- regardless of whether there is good support from the bridge team or the pilot is operating virtually as a 'one-man band'.

A good PPU compensates very effectively for the deficiencies that can be found with bridge teams and can provide the pilot with a very reliable, and potentially invaluable, 'second opinion' when it is most needed.

For some ports, particularly those handling large, unwieldy bulk-carriers with critical under-keel clearance requirements, the PPU has already become the main reference for pilotage. As with every other aspect of navigation it must not become the sole source but must be used with whatever other information is available- be that visual,ECDIS or radar.

Other benefits from PPU use

It is worth noting that there are a number of situations where the PPU is able to provide really useful information that is not readily availableby other means:

- Applying the height of tide(HOT) to the charted depths makes its display of navigable water far more useful than the ECDIS display. See Figure 1, where the HOT of 3.4 m has been applied. This is particularly so if operating with a bathy ENC (bENC) which will show far more depth information than a normal ENC's standard depth contours/declared dredged depths.
- Combining the HOT with Dynamic Under-keel Clearance (DUKC®) information via a mask overlay can show the safe navigable water available as speed (and so squat) changes.
- It is especially effective for monitoring the ship's performance when undertaking a constant-radius turn - and much easier than monitoring it on radar

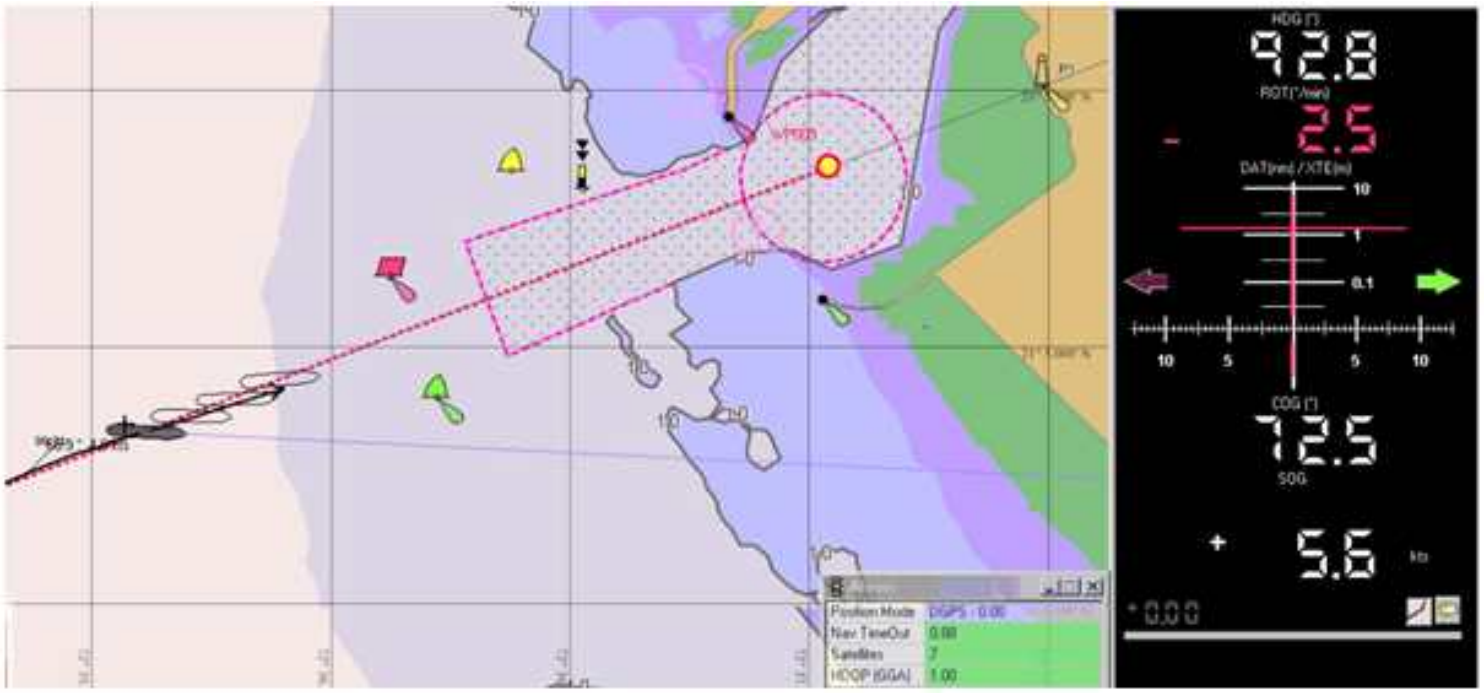


Figure 2: Port Hazira

when otherwise conducting visual pilotage. See Figure 1 again.

- It can display the cross-track distance (XTD) of the centre of the ship in relation to the planned track - which is much more relevant than knowing the XTD of the bridge. Although thedisplayed value will be differentfrom measurements based on a Consistent Common Reference Point(CCRP) based on the conning position, the bridge on most ships is right aft and will invariably be well off track when negotiating a tight turn or coping with a strong cross-wind or current.

Note that MSC 191/A allows alternative locationsto be used instead of the CCRP as necessary, where clearly indicated or distinctively obvious (as is clearly the case with the PPU).

This is illustrated in Figure 2, where an LNG carrier is entering Port Hazira in India at low speed with a 2 kn. cross-current. Although the centre of the vessel is on track, the whole of the bridge - and therefore the CCRP - is to port of the leads.

Efficiency Gains from use of PPUs

There are many ways in which PPUs can improve port efficiency; though of course avoiding major navigational incidents is a major contributor to efficiency anyway!

PPUs can help considerably in removing some of the constraints which might otherwise limitshipping operations:

- In Townsville, Queensland,they were able to resume ship movements very rapidly after Cyclone Yazi struck in 2011, despite having lost many of their navigational markers.
- In Ravenna, Italy, they can safely move ships in fog - which is prevalent in winter.
- In Port Hedland, Western Australia, they use their PPUs in conjunction with DUKC®mask overlays and bathy ENCs to regularly ship over 1 million tonnes of iron ore on a single tide, making it the largest bulk export port in the world.
- In Vancouver, they are able to take larger tankers through the very restricted Second Narrows, so reducing the number of oil shipments needed each year.
- In the St Lawrence River and on the Canadian Great Lakes they are able to move larger vessels into the ports of Quebec and Montreal, and extend the navigation season further into winter, as safe night pilotage is possible even when the lit buoys have been removed due to ice.

There are countless other ports which have also benefitted. In every case, though, it is because they have accepted that new technology enables them to expand their operating envelope; to do this they have to overcome the mind-set which says'…you should never do anything with a PPU that you cannot do without it'.

Additionally, PPUs provide a very valuable aid for training new Pilots, who can be debriefed immediately after completing a job using the playback as a reference.

Choice of principal navigation reference

At risk of whistling up a storm, I suggest that the best way

to achieve safe and efficient pilotage is to minimise the variables from job to job by always using the same prime source of information - a PPU. If that is a bridge too far, which I'm sure it will be initially for many pilots, at least make the PPU your prime secondary sensor - and in all cases provide redundancy by having exactly the same plan show on the ECDIS/ARPA.

It is important, though, that pilots' skills in other forms of pilotage do not atrophy due to over-reliance on a PPU. Visual pilotage and radar blind pilotage need to be practised regularly, but with the PPU acting as a back-up and providing a record of what was achieved for subsequent playback and analysis. Indeed, the best pilotage will undoubtedly be achieved by using two methods in tandem and verifying one against the other regularly - scanning systematically between them.

Need for proper training and for regular QA of system performance with PPUs

Even the best equipment in the world is of limited value if those using it cannot operate it properly. Ship's bridge teams should be competent in operating their own equipment, though sadly that is often not the case. Pilots will be the sole operators of their PPUs and it is essential that they have proper training both in the general principles of PPUs and in the specifics of their own equipment.

The IMPA guidelines for PPUs include a section on the factors to be considered for PPU training.

Similarly, no equipment can be 100% reliable. Pilot companies need to carry out periodic checks of the performance of their equipment, and the manufacturers are best placed to advise on how that should be achieved.

Capt Cliff Beazley
AM MNI FAMPI, Managing Director, Port Ash Australia,
28th December 2020

Managing Director at Port Ash Australia. Port Ash is a manned ship-model training facility for teaching all aspects of ship handling with and without tug-assistance. Clientele is pilots, masters, ships' officers and military CO, XO & bridge teams from major warships.

Cliff commenced his seagoing career in 1959 as Midshipman with Alfred Holt and Company, Blue Funnel Line, UK. Upon completion of his apprenticeship, he then sailed as 3rd officer with MacAndrews Line, before emigrating from England to Australia in 1964.Cliff then joined Howard Smith Ltd as third officer, and served for 10 years on tankers and bulk carriers, the last 3 years in command. In 1973 he joined the Newcastle Pilot service, which at that time was owned by the Maritime Services Board of NSW. He served for 27 years as a Pilot, the last 8 years as a Check Pilot for the Port of Newcastle.In 2000, Cliff retired as a Check Pilot from the Newcastle Port Corporation, and then went on to establish Port Ash.Port Ash commenced operations in 2001, thereby providing manned ship model training in Australia.

Ship Handling - Learning with Manned - Models

Teaching mariners how todrive a ship is often made to look very difficult perhaps because those who write books and create today's videos sometimes lack pilotage experience and descriptive powers. In this digital age, it is easy to collect a mass of data, information, knowledge, facts and figures. But then comes the task of stringing them cohesively together and applying them. This is not straightforward and I liken it to a thousand-piece jigsaw puzzle that must be turned into a picture.

Ours is an odd industry. Road drivers must be taught by experienced drivers and in the air, pilots must be taught by experienced pilots but in our industry, there is little of this as real teaching tools do not exist. Traditionally, training ships were used but being expensive and damage able, they were largely superseded by electronic simulators in the 1980s.

Simulators quickly became widespread and can conveniently be established anywhere indoors. They undoubtedly provide an excellent venue for ship handling in channels and harbours while providing a full-size bridge for team training. This was thought to be ideal, but the practical experience of my generation of pilots was that they lacked reality and 'feel'.

Being virtual and working only in two dimensions, they have their limitations.

By comparison, manned ship-model centres are outdoor venues subject to climate and geographical limitations and cannot realistically be established just anywhere. The first centre was developed in France for research

and development in the 1960s but was little noticed at a time when cost was high, travel was slow and the necessity for training was only starting to develop.

Manned ship-models work in the real world with three dimensions, 'feel', depth of field, and visible comprehensible physics and hydrodynamics. Because of the accelerated timescale, they are extremely cost and time efficient as manoeuvres can be demonstrated, practised and repeated in only a few minutes until thoroughly grasped.

For time and cost-effective visual ship handling, models are unsurpassed. It was the writer's frustrations with the physical limitations and real-time of electronic simulation which leddirectly to the establishment of our manned-model centre, Port Ash Australia in 2000.

Manned Ship-model Centres World-wide

There are now seven outdoor centres in the world sited either in temperate/warmer climes or subject to seasonal restriction. In chronological order of build, they are in France, UK, Poland, Australia NSW, USA Massachusetts, USA Louisiana and more recently, Panama. The scale used is usually 1:25 which is a compromise between realism, practicality and cost of construction.

Centres are constructed with scaled depths, berths, submerged banks, leads, buoys and the infrastructure familiar to the ship handler. This is not always physically easy to do and partly explains the high cost of building a manned-model centre and maintaining it in the face of the vagaries of nature. To use a scaled manned model in an existing expanse of water with full-size boats is to largely miss the point. A ship-model speaks for itself best within a matched scale environment especially when part of a lake emulates recognisable berths and their approaches.

Manned ship-models demonstrate theory visibly in a way that cannot otherwise be clearly seen. Having grasped the theory, manoeuvres can then be practised in the accelerated scale until thoroughly proficient. There can surely be no better way to consolidate theory than with visible demonstration and hands-on personal practice.

Ship-models

For those unacquainted with ship-models, every full-size ship is built from a tanktested model, so if the model doesn't work then, your ship doesn't work either! Accuracy of performance is therefore not in question. The laws of similitude decree that a model behaves exactly as a ship behaves using the same orders in the same sequence, but in accelerated time.

At the scale of 1:25, time scales as the square root (5x) so that helm and engine orders follow in quick succession. Initially this can be a bit confronting but by slowing the pace down, most are 'up to speed' in a few hours and able to benefit from the three-dimensional visuals and the intense practice that the accelerated scale offers.

Ship-models are equipped with helm, main engine/s, thruster/s, wind and speed direction, speed log and rate of turn. Level of equipment required is set out in STCW95 B I/12 39. In most centres, scaled remote controlled or manned tug-models are used for ship-assist to varying degree. Where these are realistically secured to the ship and properly operated, manned-model training becomes a very powerful, graphic and time-effective tool.

Commonly a ship-model carries five persons - two trainees and one highly experienced ex-pilot instructor with one or two onboard tug operators. A model's draught and trim can usually be adjusted quickly as required.

Physics and hydrodynamics in ship handling

There are two dominant natural features at work, the physics of applied forces and their levers, and hydrodynamics. The rapid shift of the pivot point and use of levers depending on the ship's motion through the water and applied forces is arguably one of the most useful aspects observed and learned when using models. There is occasional academic debate on the pivoting point position, but centres teach simply that it is approximately amidships or about one-third/quarter from each end, something that works in practice. It can be manipulated to advantage by applying forces such as thrusters or tugs, something quickly learned with the models.

Uncontrollable wind is the most inconvenient factor for an outdoor venue but even this can be turned to advantage. Casualty statistics are heavily laced with ships being blown ashore uncontrollably, so a windy day is the time to learn how *not* be blown ashore by watching the weather and instinctively applying leeway in large amounts if necessary. Gusts of 80 knots are extremely confronting but invaluable practice for the day it might happen to you! Those who pilot for decades know well that it is only a matter of time before they start a pilotage in manageable weather which deteriorates past their point of no return and must be dealt with safely; the writer speaks from experience.

Other natural forces such as current are artificially controllable and most centres use electric motors to

create it. Bottom effect in shallow water such as the doubling of a ship's advertised turning circle is graphic and measurable. Bank effect, theoretical to many mariners and rarely

experienced by most, is often poorly understood and shows well with the ship-models. During ship-to-ship transfers under way, the mutual hydrodynamic effects are spontaneously felt on both ships.

Whilst relevant physics and hydrodynamics are taught in classrooms (I hear and I forget) and demonstrated in electronic simulators (I see and I remember), they are physically felt with models (I do and I understand). You will recognize the ancient proverb. To illustrate this, a visitor from a simulation centre commented 'I've read about bank effect and seen it in our simulator, but now I've actually felt it'. Note the word 'feel'.

Added water mass or 'ship-induced current' (so described by Canadian pilot Capt. Hugues Cauvier), is water movement induced by the rotation of a deep-laden ship in a shallow swinging basin. These are very real effects and self-demonstrate spontaneously, visibly and clearly.

To summarise, demonstration of physics, hydrodynamics and the way to counter or use them are a repeatable and visible specialty of manned models.

The art of ship handling

The physics at work are complex but finite and can be observed and understood in a few days. Then comes the tricky bit - the art of putting it all together with the associated human factors. This is where repetitive practice in the accelerated time scale scores heavily in favour of models.

Good situational and spatial awareness is vital to piloting and applies to any vehicle - road, air or water - where visual judgement of distances off, their trend and stopping distances are critical. For those who struggle with this aspect, it can probably be taught and developed using manned ship-models in most cases.

In the accelerated time scale, coordinating helm, main engine and tug/thruster orders is often a challenge for beginners some of whom initially confuse helm and thruster orders. Getting all of this right is the mark of the competent ship handler and together with good situational awareness, leads to visible success in ship handling.

Errors - slips, lapses and mistakes- show well. It is quite common to forget that from a previous evolution, the helm is still hard-over and the main engine or a thruster still running. Misjudging wheel-over points when turning a corner is a perennial problem for beginners but mostly solved by individuals as the week progresses.

Different personalities experience their own problems. Not listening to or misunderstanding the onboard facilitator can lead to bewilderment – these interactions happen on real bridges too! Inherent human factors such as hesitancy, freezing, overreaction, confusion and so on are addressed as they occur, but trainees can see the results for themselves and they can be discussed with the facilitator in the debrief.

After an initial period, manoeuvres are recorded on audio-visual USB flash drive for debrief if required, then taken away for introspective analysis by the individual. Honest self-examination from lessons learned should give a new ship handler an insight into what is probably the most important life-lesson of all. 'Know yourself'.

Facilitation

It is important that an instructor/facilitator has extensive experience preferably ex-command, ex-pilot training and mentoring. Above all, a facilitator should be a patient teacher capable of letting the trainee get on with the job without interruption and aiming for brevity in speech.

The instructor isaboard the ship-model and thus able to follow all aspects of the trainee's orders and the ship's reaction as an exercise progresses. Onboard supervision is important for accurate observation otherwise the subtleties of manoeuvring are often missed. Most seafarers know the wry comment that 'the best ship handlers are watching from ashore, the second-best ones are on stations fore and aft, while the worst ones are on the bridge…'

Over the twenty years of operation at Port Ash, successful pilot selection with manned models has been well tested and proven and little doubt this occurs in other centres too. An experienced facilitator can see quickly who has the ship handling skills, who hasn't and/or importantly who might be more teachable.

In our race to modernise, it is important not to forget useful basics and it is equally important that sufficient knowledgeable and experienced instructors be identified and employed to teach these skills to future generations.

Instructionmust always require communication- words proliferate in the internet age more than ever before. But ship-model training speaks graphically for itself and successful facilitation places the emphasis on deeds, not words.

Classroom theory and demonstration

It is vital to keep theory simple and restrict it to the critical aspects used in practice on a bridge.

In the classroom with 4-6 trainees, we use a course notebook containing key facts and diagrams so that all can follow the narrative and refer easily to another page if necessary. Books and small table-top models might sound antiquated in the computer age but used together, they are a clear and simple means of visually demonstrating criticalaspectssuch as the pivot point and itslevers, their movement with tug assistance, wind, current, bank effect and other scenarios leading to success or failure.

Table-top models allow experienced pilots to demonstrate how they got into trouble and importantly, how they got out of it! As always, graphics are worth a thousand words, particularly to those whose first language is not English.Book and models used together provide a clear and powerful teaching medium supported by a screen to show live case histories.

Having established how table-top manoeuvres work, it is time to prove the veracity of the classroom teaching and 'go down to the sea in ships'.

Course strategy and method

Many useful skills are graphically imparted, demonstrated and practiced in the accelerated time scale.

For beginners, Monday is typically one of reactive ship handling and can be confronting. Tuesday typically sees improvement and on Wednesday, Monday's emergencies become routine as what was *reactive* ship handling, is now *proactive* ship handling. Further practice reinforces confidence in maintaining control of the ship so that piloting now becomes automatic and routine.

This must assuredly be a definition of good training for visual ship handling and observed repeatedly over the years, it is difficult to see how it could be improved. Experience shows that a majority of trainees successfully transfer this learning to full size and real time, but there are occasional exceptions discussed later.

Berthing methods and techniques are taught and practised – some almost forgotten with the passage of time and the proliferation of thrusters and tugs in main ports. As an example, the ability to move a small/medium ship laterally from or to a berth with only one tug is a mystery to many, but is graphically demonstrated, then practiced with the models.

Dredging an anchor is an often-forgotten turning and berthing tool used appropriately and safely, but is seldom used these days. In recent years, anchor use has - inadvertently perhaps – been discouraged in some journals because it is supposedly 'dangerous'. Actually, it always wasbut used at very slow speed and with a properly trained crew, it is entirely safe and very, very effective.

Anchor use in an emergency such as tug line failure at a critical time demonstrates well with models. Accidental anchor-drop at full speed happens occasionally and must be dealt with immediately, competently and without human casualty. Good basic seamanship demands that mariners be familiar with anchors and be comfortable with using them.

Both conventional and omni-directional tug-models are used and, as in full-size, the differences between their physical capabilities demonstrates itself very effectively.

Mechanical failure of main engine and steering, and how best to respond, is introduced carefully so as not to destroy a trainee's confidence. Failures are quickly and easily enacted at varying stages of the pilotage and are recorded for analysis and comparison if required.

Training specifics

In western culture, Aristotle is credited with saying 'what we learn we learn by doing' but this was probably ancient history even in his day. And so it is with piloting. Whether a beginner has aptitude or not soon shows itself to the training pilots. The 'natural' beginners are easy, the ones who struggle are a bit harder - we will mention helping them later.

Mentoring by senior pilots helps to identify strengths and weaknesses which must be addressed before progression and licensing. Identified and continuing areas of weakness are a concern for the training pilots and the group generally, but there are ways of addressing the problem using manned-models and electronic simulators.

Early training programs comprise and can be accelerated by instilling the understanding of how a ship moves in narrow waters, then allowing practice, practice and yet more practice! Realtime training for the same experiences in simulators or on-the-job can take weeks, months, years or may indeed not be possible at all. Critical incidents can of course, be created with a simulator but the real-time factor remains.

For those who have not been exposed to and don't understand the technicalities of manoeuvring a ship, a

structured and stepped course of 2-3 days with a knowledgeable and sympathetic instructor has been demonstrated successfully. This is unsurprising as in aviation, beginners are taught on training aircraft by experienced instructors and must achieve an acceptable level of competency with 10-12 hours flying experience before going solo. Stepped and structured training is well developed in flying schools and our industry has much to learn from these techniques. Visiting aviators often observe the parallels.

Hazard recognition on the roads is well developed in vehicle driver training and indeed in some jurisdictions, a hazard perception test must be taken. Accurate foresight in ship handling is complex and depends on the skill and behaviour of the individual, both of which show conspicuously in the accelerated time scale. Pattern recognition is important and there is anold and very true saying from aviation that 'superior pilots are those who use their superior skills to avoid those situations where they might have to use their superior skills'.

Pilot recruits

Pilot recruits struggling with their new job are of particular interest. Having left a previous position at sea and unexpectedly struggling in a new one, they deserve the best possible assistance. Usually, we find that their situational and spatial awareness needs to be developed and honed. Aspects of the 'seaman's eye' such as swinging, slowing down and judging distances when berthing need to be developed. Here at Port Ash, this is sometimes addressed with individual personal coaching starting aboard our *Lake Teacher*, an agile, responsive and forgiving 125m long 'Handysize' model. With a sympathetic instructor, the exercise of much patience on both sides and a structured program, results have shown well to date.

Training of new pilots is approached on a case-by-case basis and there has been considerable success in helping individuals overcome hurdles unforeseen when they were appointed. We have concluded that apart from a very few memorable individuals, ship handling is in fact a learnable skillset when taught methodically. Training methods deserve to be more widely studied – after all, methodical training has been used for decades by our airborne cousins.

When stepping up to larger tonnage, ship-models can accelerate training programs by demonstrating the differences inherent with larger tonnage, particularly the understanding of increased momentum and the difficulty in stopping large, loaded ships.

Understanding the control of unforgiving low-powered loaded ships when slowing and stopping is vital. Our 'Handymax' ship-model *Triton* at deep draught and trimmed on an even keel or slightly by the head, provides directional instability which many experienced pilots will recognise. In channels, it demonstrates control problems with bank effect and shows why adequate tug assistance for slowing and berthing is so necessary. These medium-size and draught ships feature disproportionately in accident investigations and handling them can be a trap even for experienced pilots.

Continuous development – refreshers – contingencies – investigations

Many pilot groups have developed Continuous Professional Development (CPD) programs which span the complex spectrum of modern piloting. This includes the various areas of interest – and there are many – so that individual pilots with specific interests can explore and develop them for the good of all.

In Australia, a formal CPD program was initiated by The Australian Marine Pilots Institute (AMPI) in 2016. It covers a variety of subjects including bridge equipment and perhaps unsurprisingly, features ship handling with manned ship-models.

These refresher courses include outcome-based contingencies and are arranged to suit a particular port or type of port. It is amazing what we can forget even in a few months, never mind a year, so refreshers on something other than the daily routine stimulate the mind and remind us of what *can* happen.

When piloting routinely and around the clock, fatigue plays a big part in a pilot's life. It is very easy to become unwary so it is good to be reminded of what can happen if a wheel order is wrongly applied by the helmsman or the main engine is at the right setting but in the wrong pitch! These scenarios are practised with models and refresh the routine importance of visually checking instrumentation on the bridge.

Most contingencies can be played out with the models – hesitant engines, tugs breaking their lines, wrong helm orders, thrusters and main engines that don't start or even stop when required. They happen rarely but coping with them relies on the wary pilot having that extra 'something up the sleeve' for contingencies when things go wrong and nobody else in the bridge team notices. A few years ago, there seemed to be an epidemic of anchors being dropped unexpectedly under way – a contingency that must be dealt with without human casualty. This is very effectively carried out with the

models.

The real world is full of urgent distractions, some of them technology-related such as irrelevant and distracting alarms. The accelerated time scale quickly shows what and what not to ignore to prevent pilot overload and possible error. This aspect translates well into real-time piloting where alarm identification and prioritisation are important.

Pilot Exempt Certificate holders on short-sea traders use tugs for manoeuvring only in the event of strong winds, bow thruster or engine failure and are little practised in tug ship-assist. This is quickly and easily demonstrated and practised using tug-models. Some centres use fans to create wind as required.

Many interesting and revealing accident investigations are available online. Just occasionally, published diagrams reveal an obvious physical cause to the initiated, but the descriptive text shows little understanding of the physics and/or hydrodynamics involved. This is puzzling and could be addressed by selected investigators training with manned models within their own area of specialty. Accidents can sometimes be re-enacted with manned models to show physical causation. While human factors are universally understood by investigators, the more obscure technical skills - probably never fully understood in the first place - sometimes go unrecognised and detract from the credibility of the investigation.

It is often a joy to watch experienced pilots carry out perfect manoeuvres and deal effectively with emergencies during refresher courses - they know their craft well and it comes automatically. Some like to experiment with non-standard alternative manoeuvres often wondered about in their own port, but never attempted in practice.

Research and development in handling technique to a particular berth with a specific class of ship with the correct tugs can be experimented with for quick and accurate comparison. An experienced onboard instructor might well bring a fresh eye to manoeuvres routinely carried out the same way for many years. Interestingly in this age of compulsive change, we find the tried-and-true way usually turns out to be best, but there are exceptions.

Use of tugs

Two days out of a five-day course at Port Ash is devoted to handling the ship-models with one or more tug-models to the same scale. The tugs are operated from aboard the ship-model by local tug masters who add their collective wisdom to the debrief after each manoeuvre.

There is a substantial difference in technique between handling ships with powerful omni-directional tugs and with the less-often used conventional tugs. More care and attention is required with conventional tugs and this shows clearly with tug-models.

The words 'stemming' and 'girting' seem to be long forgotten in many ports today and few mariners, except those offshore, know of the term 'gob line'. It is sad to see lives hazarded by a simple lack of training. Where appropriate, trainees handle tug-models themselves and learn the hazards graphically and at first hand. There is no lesson better learned by the operator of a conventional tug-model than one who has very nearly been girted!

The bridge team – channel navigation and 'the last mile'.

Some aspects of bridge resource management can be exercised despite there being no formal bridge team in a small model. One traineewill pilot the ship-model whilethe other handles the helm and throttle control as the masterand can override the pilot if required. A surprising number of trainees mix port and starboard but correct themselves immediately or are challenged by their course partner. Good personal lessons are learned in the process.

Radar and PPUs are not used but may have a place aboard large slow-moving models – this aspect is unexplored to the best of my knowledge. The accelerated time scale does not readily allow the user to shift attention easily from visual to screen, so the strength of manned models relates strictly to visual ship handling.

Visual piloting is traditional, but the world is full of wonderful new technology such as the useful PPU. Perhaps there is a lesson here as if/when technology fails,unused visual skills can perish if they are not regularly exercised.

Naval ship handling

Naval navigation training is probably the most thorough training available, but hands-on practical ship handling less so, due mainly to lack of opportunity. Ship handling training became less available in the 1970-80s with the advent of widespread privatisation of auxiliary functions, the introduction of electronic simulation, the withdrawal of dedicated training ships and the disappearance of heavy displacement boats. Electronic simulation created many benefits, but in hindsight, it was enthusiastically expected that it could do everything. It was a good guess and very nearly right!

Port Ash Australia manned ship-model centre opened in 2000 and an article in the Nautical Institute magazine 'Seaways' May 2006, described the introduction of manned manned-model training into the Royal Australian Navy in 2004. Over the sixteen years to date, Navy's training has been augmented with manned-model training for all senior officers of major fleet units and many bridge teams. This resulted in better understanding of the task at hand and reflected in a notable and measurable reduction in minor incidents.

Some ship-models are class-specific and built to Navy specifications enabling bridge teams to work together. All Port Ash facilitators are experienced ex-pilots and this has resulted in mutually beneficial and extensive cross fertilisation between the two services, possibly for the first time in several decades.

Recently, the Officer-in-Charge of the RAN School of Navigation wrote "Our extensive relationship with Port Ash continues to provide our Navigators and Ship handlers with effective, comprehensive and quality training in an environment where it is safe to fail. The nature of manned models also allows our officers to gain a large amount of training during a relatively short period and as a result of investment in class-specific models, the fidelity and quality of the training provided by Port Ash has only increased."

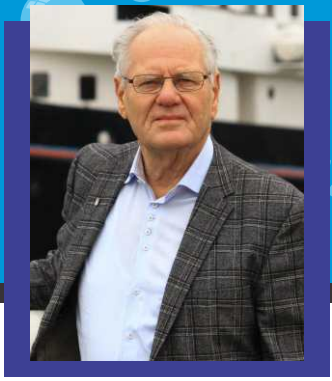
Conclusion

So - what to make of manned-models overall? Our generation of pilots - today's instructors - was fortunate enough to start piloting on small ships (aka large manned-models?) progressing in tonnage annually for three years. On-the-job training was directed by our seniors, but we were largely self-taught. None of us took the job lightly and importantly, we all had (or made?) our fair share of good luck! What models showed us retrospectively was *why* things happen and we universally wish we'd had the chance to experience a manned-model course before we were entrusted with our first piloting experience!

There is general agreement among mariners that ship-models complement simulators in many respects even without the ability to be accurately port-specific. There is a great deal to be learned from time-efficient ship handling in miniature where every generic physical and human factor can be related to a specific port, observed, understood, applied and practised.

Since inception, Port Ash has been host to most Australian and New Zealand pilots and is popular with several large USA Pacific and Caribbean coast pilot services to mutual benefit.

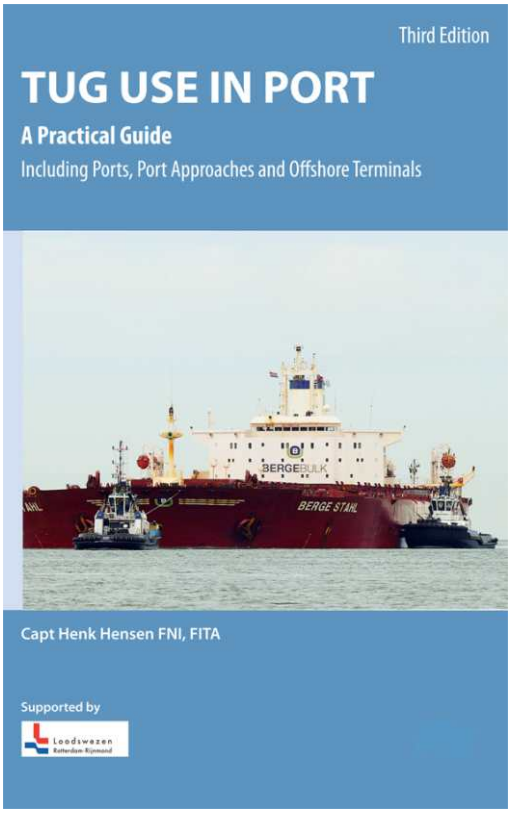
In these litigious times, most pilot services do more than lip-service to ship handling training. It is interesting in evolutionary terms that despite the rapid march of technology, we have seen four new manned ship-model centres spring up in the few short years of this century in a return to basics.



Capt. Hank Hensen FNI

Captain Henk Hensen is an author of nautical books and articles. He was born in 1935, is a Master Mariner and was a Port of Rotterdam pilot for 23 years. During his years as a pilot he was stationed at the Pilot Office for five years. During that time he started simulator courses for harbour pilots and tug captains and participated in many port studies, including simulator research. He started a database for casualties in the Port of Rotterdam and analysed them with the object of improving safety. Following his retirement, he started his own consultancy, Nautical Safety Consultancy, and works as marine consultant on the nautical aspects of port studies, tug advice and simulator training. He is a Fellow of The Nautical Institute.

Tug Use in Port



Safe pilotage depends on the pilot being aware of all the elements likely to be encountered, and where required tugs will be an integral part of the manoeuvre. It is therefore essential that all pilots are fully aware of the type of tugs that have been allocated to the vessel and the tugs operational capabilities.

When Captain Hensen published his first edition of `Tug Use in Port' in 1997 it was immediately acclaimed as the definitive reference work on port tugs and their use. In 2003 he produced a second edition, updated with new tug designs and expanded content, which was equally wellreceived. Many (hopefully most) pilots will have referred to these books and appreciated the clear and concise detailing of the various tug types.

Since the second edition was published, the world of port towage has undergone a significant amount of change, with many new and innovative designs now in operation. Consequently, in this third edition, supported by the Rotterdam pilots, Captain Hensen has rewritten the text in order to provide comprehensive details of all tug designs, their operational parameters and the optimum positioning to maximise their effectiveness. There is even a section on autonomous tugs. In addition to the tugs the book also includes a comprehensive chapter on required tug power, tug safety, (simulator-)training, towage equipment and escorting. As with the second edition, this third edition also is recommended by IMO (MSC.1/Circ. 1101/Rev.1).

Despite advances in tug design, harbour towage is still a high-risk operation and when things go wrong a routine manoeuvre can rapidly become an accident. Tragically such accidents frequently result in fatalities to tug crews, and the ship can also be endangered. These risks and their causes are covered in detail.

Lavishly illustrated throughout with photos and diagrams, this book is an essential reference work of particular relevance to pilots, and the price of 39.60 Euros (till 1 April 2021) represents excellent value. It is available directly from STC Publishing at the following link: http://www.stc-publishing.nl or email info@stc-publishing.nl.

Capt. Herman Broers
BSc. AFNI, AFRIN
Maritime Pilot, Port of Rotterdam

From Regulations and Guidelines to "Safety as a Total System"

Recently, Captain Karanjikar invited me to write an article for the AIMPA-magazine. It should cover pilot ladder safety legislation, from a "holistic" point of view. Since the start of the website pilotladdersafety.com spring 2020, I have been in contact with a lot of maritime pilots and professionals from all over the maritime industry. The question that has arisen from these discussions is "How can we change the safety of pilot ladders for the better, by going from Regulations and Guidelines to "Safety as a Total System". One cannot get more holistic than that, when contemplating an answer tothat question.

The results of the 2020 IMPA safety campaign have been reported and the results are not very good in a sense that little has changed. A quick analysis over the last five years shows that the involvement of maritime pilots is growing, however the number of noncompliant pilot ladders is not going down.

As we all know, the system of legislation covering pilotladders consists of SOLASChapter V regulation 23, Guidelines on Pilot Transfer Arrangements: IMO A.1045(27), International Standards (ISO 799:2019) and Procedures (ISM). They form a chain which, in theory, should ensure pilot ladders are rigged, used, maintained and handled in a safe and professional manner. They form a chain, with interdependencies and references to each other. Anyone saying these guidelines, procedures and standards are not mandatory is maybe right in a legal sense, but very wrong from a safety point of view. They form an inseparable set of links in the present legal and safety framework that is in place.

The international character of the legislation implies that public and private bodies have a supervising role over different parts of pilot ladders regulations and standards. Classification societies, as part of their own business, or on behalf of flag states or port state control, are the most notable. Also, there is the national coast guard agency, and after an accident or incident has happened: the river, water- or harbour-police or health safety labour inspection.

When it comes to reporting schemes about pilot ladders, a lot of initiatives can be identified, also both in the public and private domain. It remains unclear what exactly is done with the data collected, other than a chapter in anannual report scheme. All are covering part of the worldwide, industrywide problem of non-compliant pilot ladders. The NGO organisations IMPA and EMPA are putting safety of pilot ladders in the spotlight for decades. In the meantime,maritime pilots have taken it upon themselves to launch initiatives on social media, like the very successful #dangerousladders Facebook group to identify non-compliant ladders. By showing the picturesofday-to-daybad practices, it becomes clear tothe public that a perfect safety record in the field of pilot ladder still has a long way to go. The influence of these social media exposures cannot be underestimated: developments are underway to have the IMO "wheelhouse poster" changed and various shipping owners are increasingly changing their dangerous non-compliant Pilot Boarding Arrangements (PBA's), in particular the deadly trapdoor arrangements.

In the meantime, both IMPA, EMPA and various pilot's associations are pressing upon legislating bodies, shipping representatives' associations and government bodies to increase their efforts on training of good practices, and enforcement of legislation.

To sum it up, a lot of initiatives are underway, all with the best of intentions. However, it seems like there is a lot of loose sand to it, without much result, without coordination and with important stakeholders in the process only partially involved or missing at all.The problems that arise with pilot ladders cannot only be reduced to legislationand regulations, or the failure to comply with procedures and guidelines. Many of these cases can be

traced backto lack of training, bad seamanship, poor ship design or regulatory gaps.

When approaching pilot ladder safety as a total system,it is therefore necessary that all stakeholders involved in thattotal system are actually getting "involved". The issue of pilot ladder unsafety is not only a matter ofmaritime pilots and ships crews, there is more to it than that. For instance: shipowners, ship designers, legislators, classification societies, relevant NGO's and pilot ladder manufacturers should be part of this equal playing field as well.

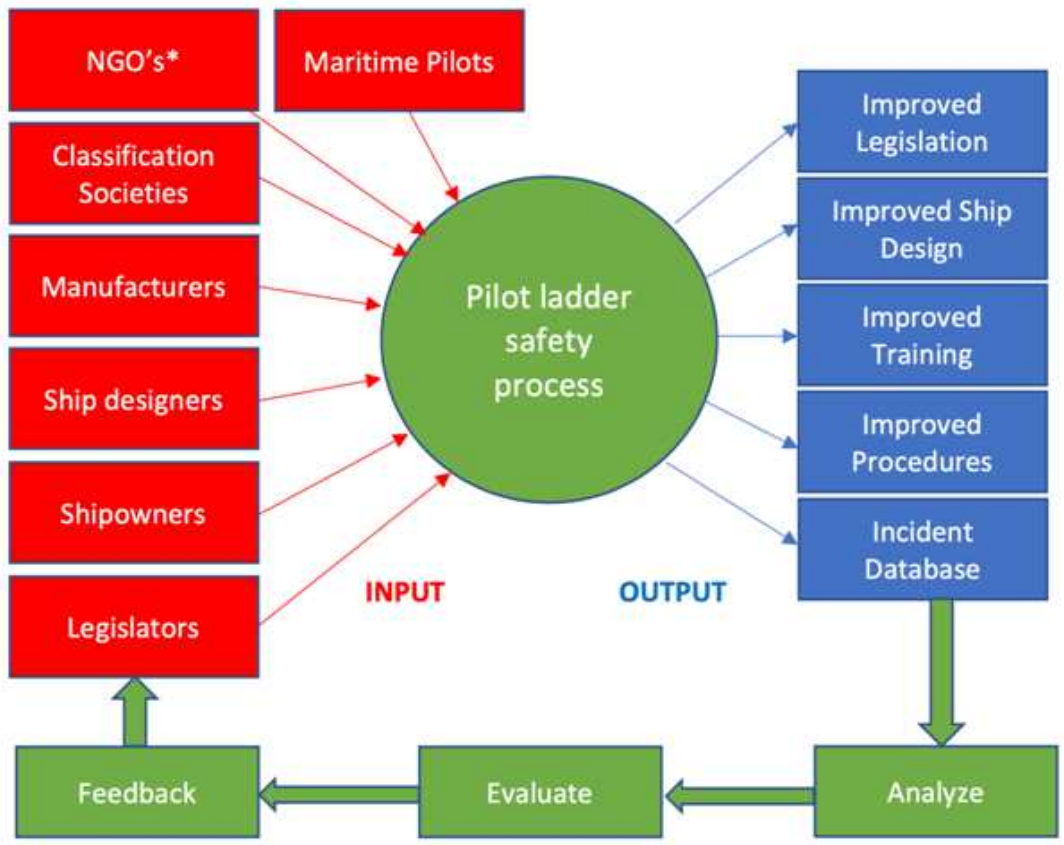
Based on the idea that collaborative stakeholders achieve more than any one of them on their own, it is time to work on a new approach of pilot ladder safety. If we succeed in establishing the connection between all stakeholders involved in an international context, we may be able to achieve (innovative) solutions that will benefit the safety of pilot ladders and maritime pilots and the industry as a whole.

* E.g.: IMPA, EMPA IMCA, INTERTANKO, IHMA

The benefits of such a cooperation amongst stakeholders could be multiple, since there are many problems that needto be solved when addressing the pilot ladder safety issue. To name a few: How can pilot ladder accessibility be risk based designed in such a way that pilot ladders are safely used, secured and stowed properly? There is no legislation about securing ladders at intermediate length, can we fill that gap? There is no worldwide data available about pilot ladder incidents, how can that be resolved? Can training into the use pilot ladders be improved, both onboard and ashore?

Therefore, the output of such aprocess could be in the form of recommendations, guidelines or standards regarding Training, Ship Design, Technical issues should be embedded in a Quality Assurance and Quality Control total system. These should be practically based, and safetydriven. In the process of continuous improvement, the results of the process should be analysed, evaluated and feedback should be given back to the stakeholders.

Much work needs to be done to achieve an industrywide initiative to improve pilot ladder safety. At the moment, there are several initiatives underway to quantify the problem of pilot ladder safety. With the outcome of various studies, it should be possible to get legislators and other relevant stakeholders interested in to join maritime pilots into finding solutions. That is a first goal. In the meantime, we must continue the work towards the goal of getting a zero-incident record onpilot ladder safety.



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