

Plumbing the Depths: Hydrographic Concerns for Modern-Day Large Vessels



Over the past 12 months, ports around the world have heralded the arrival of ever-larger, record-breaking container ships, such as San Francisco recently welcoming the arrival of the *CMA CGM Benjamin Franklin* (18,000 TEU capacity) and Gothenburg, Sweden, likewise doing the same with the *MSC MAYA* (19,224 TEU capacity). However, having evermore valuable and complex cargoes sailing through areas of the world where the salvage industry is ill-equipped to handle such large casualties is a concern for operators, insurers, salvors, and environmentalists alike.

WITH INCREASE IN SIZE COMES GREATER RISK

Commercial vessels of enormous proportions – in terms of length, width, and depth – are already, or will soon be, plying waters around the world that have never before witnessed such vessels, or so many of them. From a commercial and economic perspective, this bodes well for maritime trade, as economies of scale should see transportation costs per unit of cargo reduce (ignoring the currently alarming freight rate vacillations, due to overcapacity and economic slowdown in some places).

However, alongside this euphoria of new, wider waterways and larger vessels comes a plea to governments to invest more in the funding and the performance of systematic hydrographic surveys of national waters, and to collaborate with other nations to perform far more extensive bathymetric surveys of international waters, beyond their immediate areas of responsibility. Since January 2016, the International Maritime Organization (IMO) has been granted powers to audit the performance of countries in the way they are fulfilling their safety of life at sea (SOLAS) obligations to provide safe passageways for vessels; however, as matters stand, the IMO

has no power to force countries to fulfil their obligations.

Commercial vessel operators should also be encouraged to share the bathymetric data their vessels collect, as a matter of course, with international bodies to ensure safe passageways for increasingly larger vessels. We understand this is not always the case.

Today, accurate bathymetric data is inadequate or non-existent in large tracts of the world's oceans and seas, with large areas either unsurveyed or not re-checked since old lead-line soundings, measured in fathoms, were taken nearly a century ago, when vessels literally “plumbed the depths.” It is therefore imperative that those governments and ports that are keen to herald the arrival of newer, larger vessels provide accurate bathymetric data to modern standards, where necessary, to ensure safe and navigable waterways for modern vessels to use.

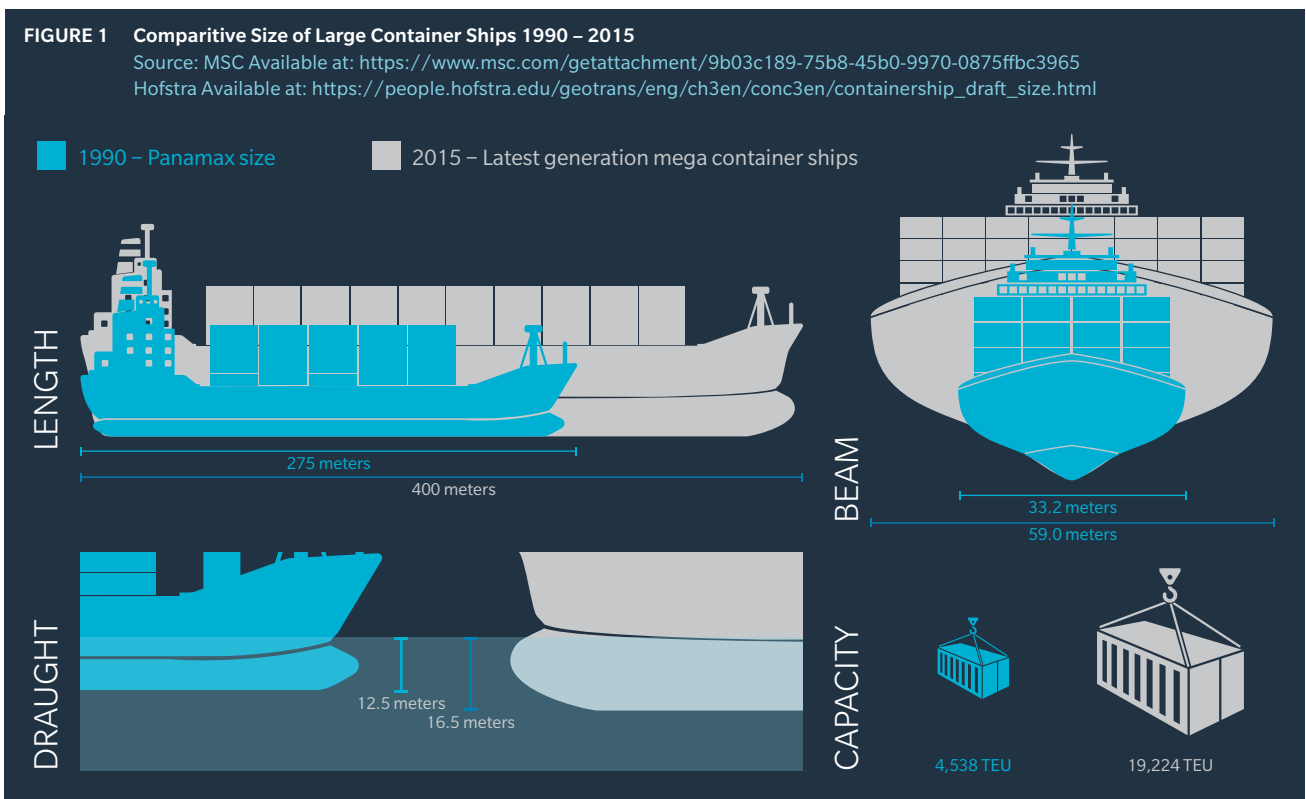


SPOTLIGHT

Global Developments

The commercial maritime world is witnessing a host of important developments that could significantly alter the pattern of shipping in the future:

- August 2015 saw the opening of the new Suez Canal, allowing more vessels (possibly up to double the previous maximum number) to transit the Canal each day.
- 2016 will see the opening of the new Panama Canal (or to be more precise, the new locks and deeper channels within the canal system).
- The undoubted impact of global warming is making the possibilities for summertime Arctic transits between Asia and Europe an increasingly attractive proposition.
- The size of commercial cargo vessels (especially containerships) have grown in the past 25 years, from a maximum capacity of about 5,000 TEU (20-foot equivalent units) in 1990, to the newest currently on order, which have more than 20,000 TEU capacity.



“We have better maps of the surface of Mars and the moon than we do the bottom of the ocean. We know very, very little about most of the ocean.”

GENE FELDMAN, US OCEANOGRAPHER AT NASA (USA).¹

At a recent “Oceans of Knowledge” conference at the Royal Institution in London, conducted by the Institute of Marine Engineering, Science, and Technology (IMarEst), considerable concern was expressed about the reliability and accuracy of nautical charts (both paper and electronic) widely used on-board commercial vessels today. The International Hydrographic Organization (IHO), the intergovernmental organization that coordinates the world’s coverage of official nautical charts, provides some shocking statistics about the extent – or lack of – of reliable data (SEE FIGURE 2).

For example, in the UK, less than half (49%) of UK waters are deemed to be adequately surveyed to modern standards using swathe bathymetry.² The picture gets worse in other parts of the world, with 95% of Arctic waters either not surveyed to modern standards or not surveyed at all.

While bathymetric and hydrographic survey work is seeking to provide more accurate information, the task is huge and the oceans are vast. The bathymetric data collected by commercial vessels as a routine part of their navigation is sometimes viewed as “intellectual property” by the shipping line that collects it, and

it is therefore not always shared for the safety of all. International bodies such as the International Maritime Organization (IMO) have no power to force governments to prioritize this work more urgently, nor can they exert pressure on shipping lines to share their data. However, with these ever-larger vessels entering new waters, there needs to be more urgency demonstrated by governments (both local and national) to ensure safer navigation for our seafarers and a more collaborative attitude among ship operators.

Furthermore, greater responsibility needs to be accepted by nations to survey international waters beyond their own national territories, which, although often remote, are not necessarily always deep, with many deceptive and often unexpected shallows. The IHO is actively investigating crowdsourcing to augment the work done by official hydrographic survey vessels.

FIGURE 2 Selected IHO examples of the percentage of adequately surveyed coastal water depths of up to 200 meters, as at February, 2016

Source: As published in IHO Publication

C-55 - Status of Surveying and Charting Worldwide available at <http://www.iho.int>.

Readers are strongly advised to visit the IHO website to download the latest version of the C-55 publication.

COUNTRY	ADEQUATELY SURVEYED	REQUIRES RE-SURVEY	NO SURVEYS
UK	49%	22%	29%
AUSTRALIA	35%	20%	45%
JAPAN	46%	47%	7%
NIGERIA	20%	70%	10%
PHILIPPINES	25%	50%	25%
PANAMA	25%	75%	0%
ANTARCTICA PENINSULAR (where cruise ships increasingly go)	0%	40%	60%
THE REST OF ANTARCTICA	0%	1%	99%

As can be seen from comments made by Rear Admiral Tim Lowe RN (right), the estimated percentage of adequately surveyed US waters stands in sharp contrast to those of most other nations (SEE FIGURE 2), which is all the more significant when we consider the huge coastlines that the US administers. This should be a lesson to those other nations of what can be achieved when the importance of conducting systematic hydrographic survey work is prioritized.

OLD ROUTES REQUIRE NEW SURVEYS

Navigation routes, such as those leading to or from the Panama Canal, have been the same for many years, with commercial cargo vessels following tried-and-tested pathways through the sea.

However, the known safe depth for the navigation of many is only as good as the draught of the largest, deepest vessel ever to have used it.

The Master of a vessel with 12 metres (39 feet) draught might feel confident following a tried-and-tested route, as earlier ships of that draught and width have not reported any bathymetric problems; however, it does not follow that the same route will be equally safe for a larger vessel of (say) 16.5 metres (54 feet) draught (if you add the “squat effect” to the published draught measurements*), and nearly double the width of earlier generations of container ships. That extra four metres (13 feet) of depth could be the vital difference between uneventful navigation and a serious grounding or stranding, with all the perils of ship damage, crew endangerment, cargo loss, and marine pollution that could result.

*The *squat effect* is the hydrodynamic phenomenon (Bernoulli's Law) by which a vessel making headway through shallow water, creates an area of lowered pressure beneath it, (as it pushes water out of its way at the bow), causing the vessel to be drawn downwards towards the seabed, reducing keel clearance. The faster the vessel moves forward in shallow water, the greater the effect.

The figures for the US are far more encouraging; as, Rear Admiral Tim Lowe RN (the UK's National Hydrographer) has told Marsh:

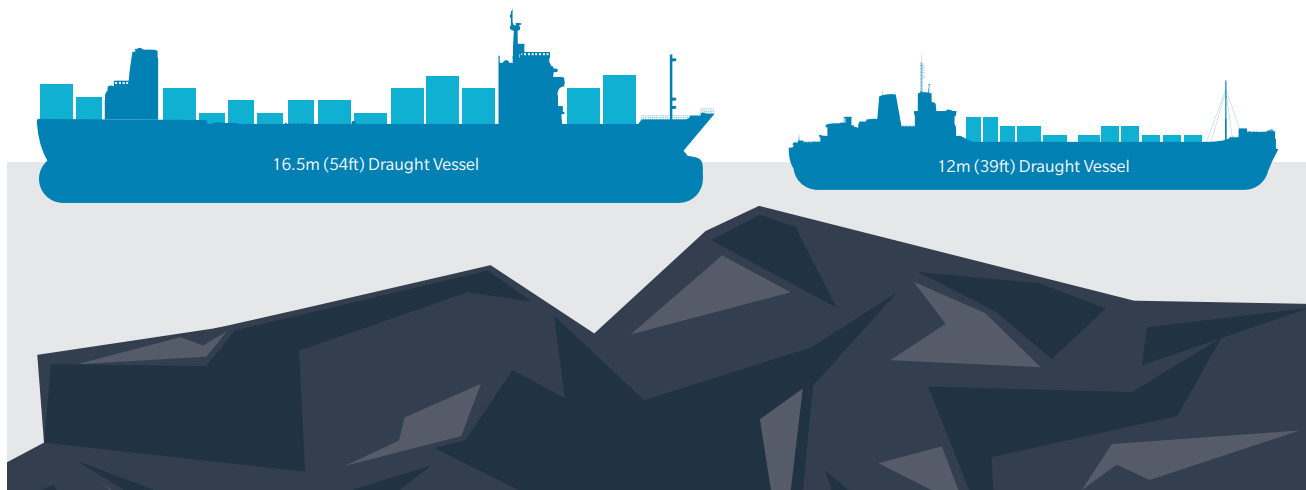
“The US prioritized survey program has already resulted in 75% of navigationally significant waters, that are determined to be critical to surface navigation, being surveyed to modern standards, but it is a complex calculation.”³

**REAR ADMIRAL
TIM LOWE RN**
THE UK'S NATIONAL
HYDROGRAPHER

FIGURE 3 Existing “large” vessels sail over rock protrusions that the latest mega-ships may strike, due to their deeper draughts

Source: MSC Available at: <https://www.msc.com/getattachment/9b03c189-75b8-45b0-9970-0875ffbc3965>

Hofstra Available at: https://people.hofstra.edu/geotrans/eng/ch3en/conc3en/containership_draft_size.html



As containerhips are the largest users of both the Suez and Panama Canal systems (both in number and in tonnage terms), these are the vessels that, having the ability and commercial reasons to navigate new parts of the world’s oceans, are of most concern. Although too large to use either the Suez or Panama canals, should one of the new generation of mega container ships suffer a grounding or stranding because the existing paper charts or ECDIS (electronic chart display and information systems) provide old and less reliable hydrographic detail, the consequences could be dire.

Governments that are keen to encourage such large vessels to use their ports and terminals will often be the first to blame the shipping industry when a serious grounding or stranding accident occurs in their waters. But how much of that blame should actually lay at their own doorsteps, when ensuring (and, where necessary, the funding of) hydrographic surveys to modern standards has not been given the priority that it ought to have done, especially when it is known that increasingly larger vessels will be using their waters?

SALVAGING LARGE VESSELS COULD CREATE EVEN LARGER PROBLEMS

Speaking about the potential issues involved in salvaging large container vessels, Peter Pietka, chief executive of Svitzer Salvage was quoted in *Lloyds List* on September 22, 2015, as saying: “Any ship of 6,000 TEU or more would pose challenges, given the lack of equipment with the height and reach to remove container stacks and lighten their loads.”⁴ Meanwhile, in 2012, Andreas Tsavlis, then president of the International Salvage Union (ISU) said:

“International business these days operates on the “just-in-time” supply principle and container ships perform the function of floating warehouses. Interruption to the supply chain can have huge economic consequences and financial cost. Indeed the cargo values are bewildering – consider thousands and thousands of containers full of electronic goods coming from the Far East to Europe. Hundreds of millions of dollars – even billions – worth of goods may be on board. I do not believe that the shipping industry as a whole is ready to deal with a mega box ship casualty.”⁵

Let us not forget that the attempted and ultimately unsuccessful salvage of the *MV Rena*, after it grounded on Astrolabe Reef, New Zealand in October 2011, resulted in one of the largest ever protection and indemnity (P&I) losses to the market. And the *Rena* was a very small containerhip in comparison to the modern generation. The International Transport Forum report about mega-ships, itself quoting the *Allianz 2015 Shipping Review*, said that: “It ... could take two years to remove all the containers from a 19,000-TEU ship in the event of an incident, assuming that it was possible at all (*Allianz, 2015*).”⁶

Robert Ward, the President of the IHO, told Marsh of his concerns with larger-than-ever vessels plying new routes when he said: “Every vessel has the opportunity to be a survey vessel – at least once. These concerns about the reliability of nautical charts have been voiced with the IMO, UN General Assemblies, the Arctic Council, the Antarctic Treaty Consultative Meetings, the EC [European Commission], and others, but apparently without there being much active recognition or significant action from them regarding the potential risks such lack of hydrographic knowledge poses to the new, larger vessels.”⁷

FIGURE 4 The Arctic Sea Routes
Source: www.swmaps.com



The lack of hydrographic data for the Arctic region should remain a major concern for any sensible operator.

EYES ON THE ARCTIC

Many vessel operators have been viewing, with great interest, the increasingly viable Arctic routes between Asia and Europe as an alternative to the much longer (both in time and distance) routes via Singapore and the Suez Canal. However, the vessels that have, to date, successfully transited the Northern Sea Route (NSR) around northern Russia have been relatively small in size. Marsh has already voiced concerns about the potential risks of larger vessels using this route with greater frequency⁸, but the knowledge that so few of the waters have been adequately surveyed for depth adds to those concerns. Nevertheless, numerous vessels have “cut a pathway” through the Northern Sea Route (NSR), and the temptation for operators will be to attempt that route more

frequently and/or with larger vessels during the summer months.

In addition, there is increasing talk of commercial use of the Northwest Passage (NWP) around northern Alaska and through the many islands of northern Canada, which still pose considerable risk and where the waters are even less bathymetrically assured than parts of the NSR. Only a handful of commercial vessels have ever successfully transited the NWP, yet some operators are already heralding those few successes to prove the NWP to be a major route for the future. The lack of hydrographic data for that whole region should remain a major concern for any sensible operator.

The IMO has been proud to announce its adoption of the Polar Code to improve the safety standards of vessels, the equipment on board,

and the training of crews operating in the Arctic and Antarctic regions.

There are numerous references in the Polar Code to the dangers of these waters. Even in the preamble to the Code it warns: “*The Code acknowledges that the polar waters impose additional navigational demands beyond those normally encountered. In many areas, the chart coverage may not currently be adequate for coastal navigation. It is recognized even existing charts may be subject to unsurveyed and uncharted shoals.*”⁹ There are numerous other references within the Code (see chapter 10 of the Code) to the caution that should be exercised when navigating through Arctic and Antarctic waters, with a loud warning about the possible consequences of deviating off planned routes.



SPOTLIGHT

Salvage Concerns – a Real Case

Speaking to Marsh, Resolve Salvage & Fire cited a salvage operation it responded to in the Coronation Gulf along the NWP route, which demonstrated concerns about the salvage of large vessels in remote areas:

“This incident involved a cruise vessel that struck an uncharted rock at 12 knots and subsequently grounded. A difficult and logistically challenging salvage operation ensued in harsh weather conditions that required mobilizing personnel and equipment via seaplanes and vessel assets from the north slope of Alaska and northeast Canada.

“Fortunately, it was a relatively small vessel and by chance there was a Canadian Coast Guard icebreaker operating in the vicinity that was able to evacuate the passengers,” said Todd Schauer, Director of Operations for Resolve Salvage & Fire. “As our cruise-industry clients are aware, there are greater risks involved in navigating these areas, and fortunately progress is being made for improving the safety of operations in Arctic and Antarctic areas,” he added, “but a major casualty in these regions involving a large passenger vessel would be an extremely challenging and serious event for evacuating passengers and conducting salvage operations.

“In this case, RESOLVE was able to refloat the vessel just before the onset of a major winter storm and freeze-up that would have precluded any possible refloating of the vessel and would have resulted in an expensive wreck removal the following summer season.”¹⁰

Even in waters where charts and ECDIS are considered more reliable, concerns still remain. *“New and navigationally significant features continue to be discovered. In 2015, France reported a previously uncharted submarine wreck, at the South West entrance to the Gironde estuary (access to Bordeaux), 7 meters above the seabed, and significantly shoaler soundings (7.4 meters rather than 17 meters) in a sea lane from Anse de Miquelon to Saint-Pierre (Saint Pierre et Miquelon). These discoveries are not untypical,”⁷ says Robert Ward of the IHO.*



SPOTLIGHT

A Timely Warning

The recent grounding of the CSCL *Indian Ocean* in the approaches to Hamburg, Germany, is perhaps a salutary lesson to us all. While no one is suggesting that hydrographic surveys of the Elbe River were in any way deficient (we know exactly how shallow that river is in places), nevertheless, when such massive vessels have steering (or other on-board) problems, the margins for error in such narrow channels is becoming ever narrower. Thankfully, the CSCL *Indian Ocean* was eventually successfully refloated on a spring tide, but serious concerns have emerged that, had that operation failed, the availability of equipment to be able to discharge the cargo of a stricken 19,000 - TEU containership stranded or grounded in that position was not available.

“As our cruise-industry clients are aware, there are greater risks involved in navigating these areas, and fortunately progress is being made for improving the safety of operations in Arctic and Antarctic areas...”

TODD SCHAUER
DIRECTOR OF OPERATIONS
RESOLVE SALVAGE & FIRE



CONCLUSION

As mega-ships continue to proliferate, some tried-and-tested (and previously trusted) ocean routes pose new risks to those larger vessels. Accurate bathymetric data is inadequate or non-existent in large tracts of the world's oceans and seas, with large areas either unsurveyed or not re-checked since old lead-line soundings, measured in fathoms, were taken nearly a century ago when vessels literally "plumbed the depths." The following must therefore be addressed as a matter of urgency.

- National governments need to realize the importance of providing the maritime shipping world with accurate bathymetric data and reliable hydrographic charts to modern standards, using the latest swath bathymetry equipment.
- Governments need to consider investing more in the funding and the performance of systematic hydrographic surveys of their national waters and, where possible, international seaways.
- Commercial vessel operators should also be encouraged to share bathymetric data gathered on their vessels with international bodies to ensure safe passageways for increasingly larger vessels.

This is a plea that the International Hydrographic Organization has been making, and one that clearly needs to be listened to and acted upon with some urgency. Governments and ports that are keen to herald the arrival of newer, larger vessels need to provide accurate bathymetric data to modern standards wherever necessary to ensure safe and navigable waterways for modern vessels to use.



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