i3 · **INTEGRATING INTELLIGENT INFORMATION** IS A MAGAZINE PUBLISHED BY JEPPESEN® A BOEING COMPANY

i3

Q3.2014
05

DOWN *here* UP *there*

Marine meets aviation

i3

Making Waves
From a flat globe to fuel efficiency.

Moving with the Waves
Augmented reality; captains from sea and sky.

Mastering the Waves
A fix on the future: Next-generation leaders, technology and WIGs.

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Up there & down here

In a more-for-less world driven by innovation, change is the only constant. "Business as un-usual" – involving an ability to change business models, strategies and alliances to keep abreast of change – is gaining traction.

An ability to change perspective is necessary for innovation, but never easy. It might require us to step back and adopt the "bird's eye view" of an airline pilot, to see the bigger picture and wider context. Or maybe we need to take a "view from the bridge," like a sea captain focused intently on gaining a deep, 360° understanding of their surroundings.

Whether we zoom "in" or "out" to gain perspective, we are always seeking to broaden our horizon: the point where sea and sky meet.

Making Waves

Stories to help raise your gaze.

FLAT MAPS, ROUND EARTH
Stretching the Earth onto a flat surface.
p.6

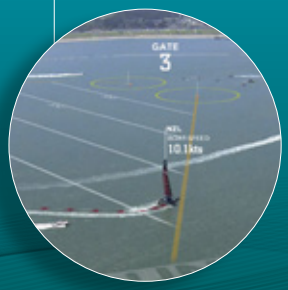
EFFICIENCY
Fueling innovation.
p.8

i3 **· INTEGRATED INTELLIGENT INFORMATION**
Data to the power of three. *i3* magazine explores how radical transformation occurs and how integrated intelligent information fuels it.

i3 is a magazine for partners and customers of Jeppesen. It is also available in PDF format at www.jeppesen.com/i3.

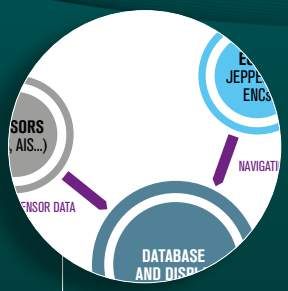
Moving with the Waves

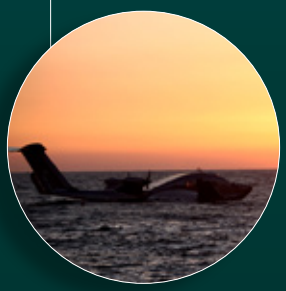
Stories of transformation closer to home.



Mastering the Waves

Stories that dive deep into marine issues.





Welcome to the fifth issue of *i3*. Our mission is to share insight, promote dialogue and to explore how integrated intelligent information can radically transform global transportation.

American philosopher and cultural ecologist David Abram recently challenged maritime leaders with his assertion that global business must understand Charles Darwin's *real* message: Cooperation is the smartest way to compete.

The transition from competition to smart collaboration is an example of how businesses are transforming the way they work. Transformation harnesses broad-ranging skills and unique knowledge to create bold new solutions. As our featured industry expert, BW Group's Andreas Sohmen-Pao puts it, *"Having several stakeholders or different points of view will yield a better answer than just trying to do it from one industry angle."*

The marine and aviation industries exhibit both remarkable similarities and striking differences. Jeppesen serves both industries, and sees many parallels in the complexity of the digital transformations they face. Each can learn much from the other. This issue of *i3* explores these transitions and how new alliances and forms of cooperation are winning the day.

Within digital navigation, printed information is increasingly being digitized, as the ECDIS race demonstrates. Commercial marine and aviation operators share a desire to increase operational efficiency and drive down costs, and therefore pursue similar solutions, from optimized routing to weather and cargo monitoring. Data standards and interoperable systems are enabling customers to make better decisions through more intelligent information. In fact, the big idea is simple: Give people the right information and they make better decisions. Better decisions create more value.

Clearly, with constant innovation the default, we must seek new forms of collaboration and cooperation. I hope this issue of *i3* appeals to you both as a member of the global marine community and as an individual with an interest in everything maritime.

Our *On the Radar* feature (pp. 20-23) spotlights BW Group CEO Andreas Sohmen-Pao's profound knowledge of shipping. *Couch sailing* (pp. 16-17) looks at elite sailing's use of augmented reality. In *What's a WIG* (pp. 26-29), we present an innovation whose time has come. *ECDIS: The Next Generation* (pp. 24-25) explains the next step in transitioning to paperless navigation.

i3 aims to help transform the way we communicate. This issue contains links/QR codes to help you access online information and insights. It also connects you with thought leaders and decision makers in the commercial marine industry via e-Navigation.com and its discussion group on LinkedIn.

I sincerely hope you enjoy your reading, browsing and networking!

Alex Zakroff,
Vice President and General Manager, Jeppesen Marine

QR CODES

On the pages of *i3* you will find QR Codes that connect you to inspiring digital content and product or service information.

http://e1.no/uwWKVH

TO USE A QR CODE:

1 Use a camera-enabled smartphone or tablet.

2 Find a QR code reader App (or download one).

3 Scan the QR code.

4 You will be quickly linked to digital content.

If you prefer, you can type the "short URL" beside the QR code straight into your web browser to access the same information.

Making Waves

The world moves on:
From a flat globe to fuel efficiency.

Flat maps, round Earth

Mapmakers have searched for the perfect way of flattening out our planet for centuries, yet the quest is still on.

When people believed the Earth to be flat, cartography was a matter of depicting the known world encircled by the ocean. After the concept of a spherical Earth demolished the myth of a disk floating in the seas, mapmakers faced a challenge: how to transfer a round planet onto a flat map?

ROUND TO FLAT

Map projections – mathematical transformations of a sphere to a flat surface based on grid of latitude and longitude lines – have challenged cartographers for centuries.

Greek scientist Eratosthenes of Cyrene was the first to map out the world using parallels and meridians in the third century B.C. His successor Claudius Ptolemy, an Egyptian scientist and mathematician, refined the map projection in the second century B.C. He assigned coordinates to known geographic locations and measured latitude from the equator.

In Ptolemy's projection, meridians appeared as curved lines, reflecting the spherical shape of the Earth. This approach, however, presented a problem for sea navigation. With curved meridians, sailors would need to constantly adjust the compass bearing if they were to draw a straight line and try to follow it to reach their destination.

The true revolution in nautical charts – and efforts to stretch the Earth onto a flat surface – came in 1569, when Flemish cartographer Gerardus Mercator designed his projection with meridians parallel to each other. As a result, any straight line drawn from point A to point B would match a compass bearing.

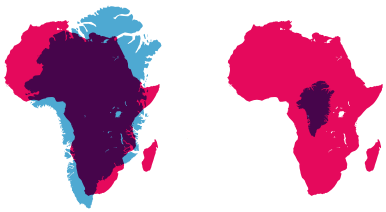
This projection stretches the points where all meridians meet at the poles into lines equal in length to the equator. As a result, it shows Greenland to be bigger than Africa. In reality, Africa is 14 times larger.

German mathematician and astronomer Karl Brandan Mollweide created his elliptical projection in 1805 with the aim of accurately representing area proportions. Here, the central meridian is half the length of the equator, which solves the Greenland problem but sacrifices the accuracy of angles and shapes.

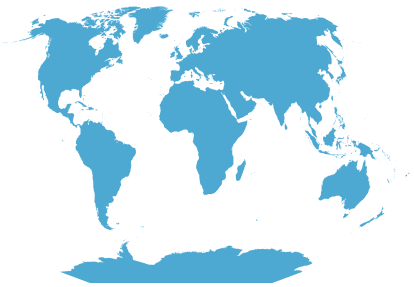
The 20th century saw a vast number of new projections appear, some of which were radically different in their shape and properties. American architects Bernard Joseph Stanislaus Cahill and Richard Buckminister Fuller, in pursuit of minimal distortion, invented foldout projections. Cahill's Butterfly World Map was a rubber-ball globe, cut at meridians into eight adjacent triangular lobes. When pressed onto a flat surface under the glass,

EXPERIENCE MAP DISTORTIONS ON GOOGLE MAPS

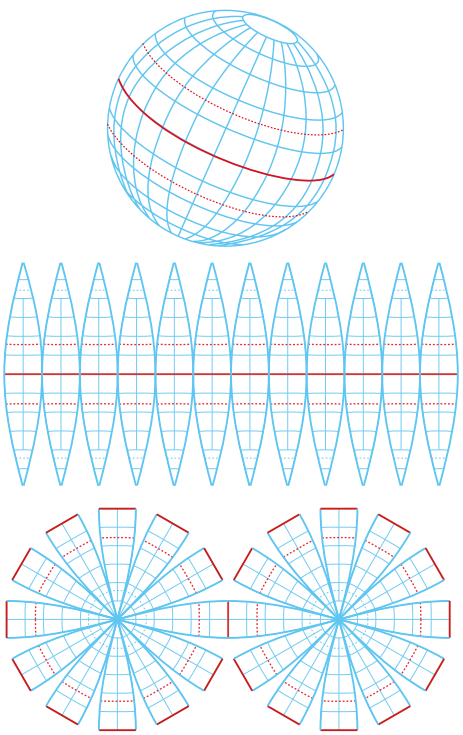
http://e1.no/5mpzl



Mercator's projection and Greenland's size compared to Africa's, displayed vs. real.



Winkel Tripel's projection



Waldseemüller's gores

it would become flat. His colleague Fuller projected our planet onto a surface of an icosahedron, a shape with 20 triangular faces, which unfolded into a flattened two-dimensional Dymaxion map.

In 1988, the National Geographic Society (NGS) adopted the Robinson projection by an American geographer Arthur H. Robinson, which deliberately distorted some areas in favor of creating an aesthetically pleasing way of showing the globe as a flat image. A decade later, NGS switched to Winkel Tripel projection by German cartographer Oswald Winkel that attempted to minimize the distortion of three elements: area, direction and distance.

However, it is the Mercator projection that is still widely used for navigation today. While there are no regulated standards on projections used for electronic navigational charts (ENCs), many of them rely on the Mercator projection. Google Maps is another example.

FLAT TO ROUND

Maps may be easier to store and view on screens, yet only globes can accurately represent the Earth. Historians believe the first globe existed as early as the second century B.C., and the oldest surviving terrestrial globe dates back to 1492. To meet the demand for globes in the 16th century, German cartographer Martin Waldseemüller created gores, wedge-shaped segments of a map that could be printed, cut out and glued onto a wooden sphere. A similar process is still used today.

As globes change status from practical to decorative, the accuracy of gore production and application may have become secondary. However, this is not the case with Peter Bellerby, a contemporary globemaker from London. Bellerby set out on a quest to create a perfect globe after discovering that no current globemakers produced accurate models. In his passion for precision, he spent 18 months perfecting the goring process and creating a custom software solution to morph a map into gores. Bellerby & Co. uses an equi-rectangular projection and a different number of gores depending on the size of globe – the bigger the globe, the more gores are required.

Bellerby believes that in a hundred years, the Bellerby & Co. globes may be the only ones of interest from our time; the others will not have survived or be considered unworthy of restoration.

When globes vanish from the face of the Earth and only maps remain, the world may as well be proclaimed flat, again.

Fueling innovation

New energy-efficient vessels and aircraft are rapidly replacing their fuel-hungry predecessors. Vehicle graveyards are a testament to two things in the shipping and aviation industries: the drive to innovate, and soaring fuel costs that have reversed the capital expenditure – operational expenditure balance.

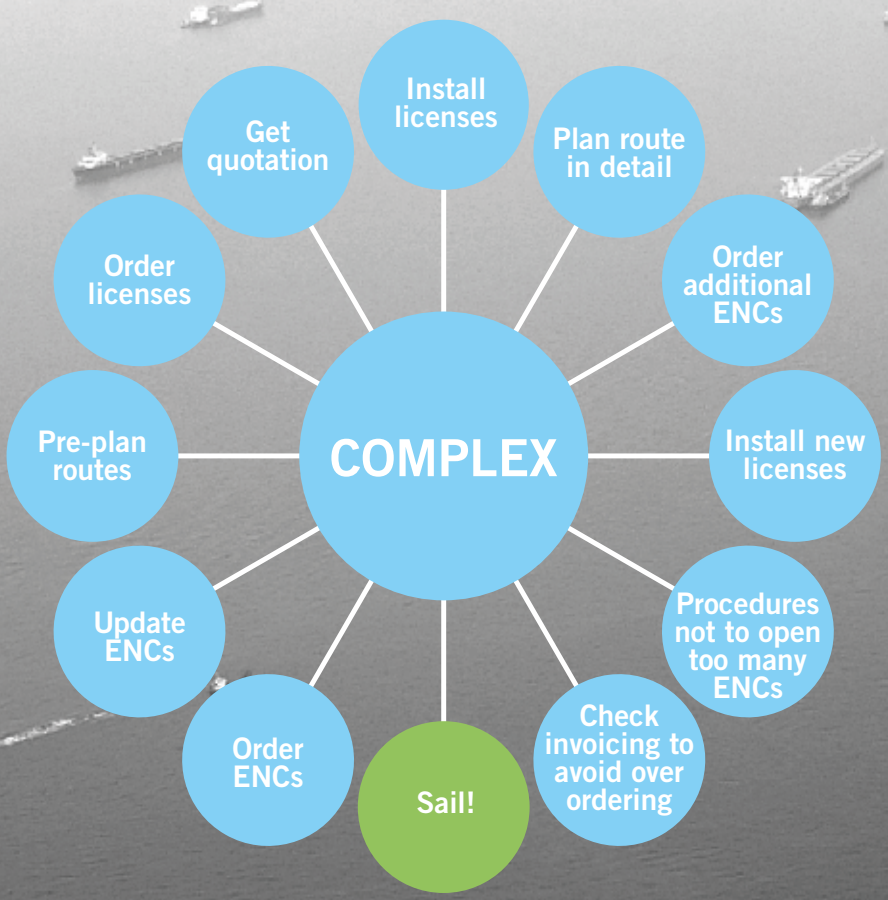
AMARC, PLANE GRAVEYARD, TUCSON, ARIZONA, USA

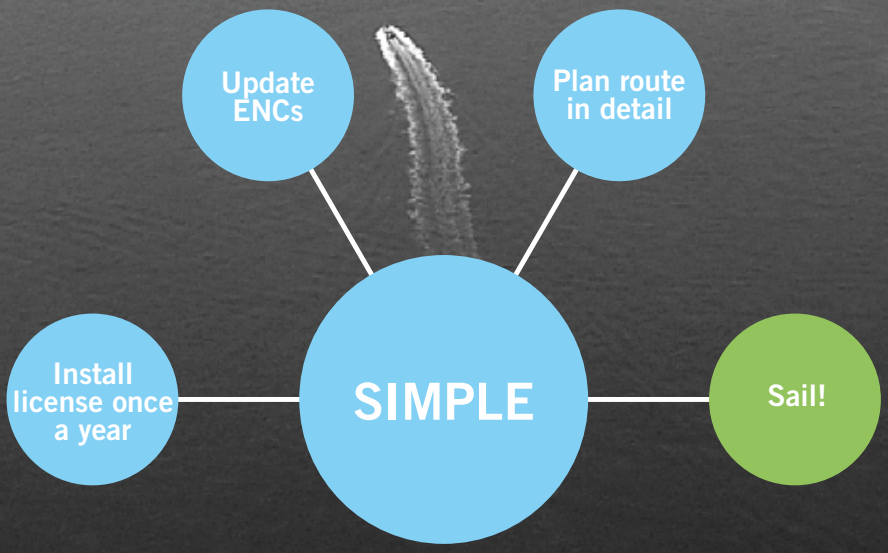
Size: approx 2,600 acres
Aircrafts stored: approx 4,200 valued at $27 billion
Number of employees: approx 600

FUTURISTIC TRANSPORT, SOUTH KOREA

The WSH-500 is a 50-seater WIG ("Wing-in-ground-effect") craft. Ready for commercialization, it is faster and more energy efficient than hovercraft, hydrofoils and high-speed ferries.

How do you want your ENCs?





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Moving with the Waves

Multiple viewpoints: Augmented reality; captains from sea and sky.

Up there & down here – Captains' Views

Ship and aircraft captains have always had a special status and a certain mystique… Some captains may be more visible than others, but we depend upon them for everything from holidays abroad to the food on our plates. What is life like today for these unique people, a breed who spend as much time in the skies and on the oceans as on land?

We spoke to a captain from "up there" and one from "down here" about their common issues and the contrasts between the worlds of aviation and marine. Both our captains have now "landed" to find new roles that draw on their insights and experience at sea and in the air.

CRAIG L. THIGHE

Craig L. Thighe is a research solutions strategist at Jeppesen Digital Aviation in Englewood, USA. He had his first flight lesson at age 15, but always knew he wanted to fly. *"I remember when an airline pilot came to talk to my elementary school class. He had a poster with a mock-up of a cockpit on it and it immediately hooked me. I knew at that point that I wanted to be a pilot."*

Although Craig is the first licensed pilot in his family and first to join what he calls *"the select community of aviators,"* his grandfather was in the Royal Air Force (UK). Flying's main appeal is learning a skill that few people have, says Craig, *"There is something exciting and powerful about flying an aircraft. It's about mastery, precision and being a professional."* He also appreciates seeing some truly fantastic sights: *"Sunrise at 35,000 feet is something you never tire of!"*

The demands on a pilot to stay updated and fly safely are many. In-flight tasks are endless and preparations meticulous. Craig also mentions the more personal challenges, such as missing holidays, family events and other personal activities due to being on call.

Craig has seen technology advance at a rapid rate in the aviation world during his career. *"Cockpits have become more complex, but technology makes the pilot significantly more aware of the 'big picture.' New tools have totally changed the way we operate, tablet computers have drastically changed the way we view and get information for our flight."*

Although he now works on the ground as a research solutions strategist for Jeppesen, Craig still teaches flying and is an accredited pilot examiner. *"I came to Jeppesen from a full-time flying job and found that I love the opportunities it's afforded me. It's also allowed me to focus on one of my favorite aviation activities, which is teaching people to fly. I love providing aviation education and watching people become better and safer pilots."*

Does he have a professional memory to share with his grandchildren? *"It must be having the opportunity to fly at 49,000 feet, which is over nine miles above the earth."*

SIGMUND HAMMERSLAND

Sigmund Hammersland is an offshore instructor at Farstad Shipping's offshore simulation centre in Perth, Australia. He gained his sea legs at an early age, starting work on a fishing trawler straight after leaving school. He has a very pragmatic view of the appeal of a life at sea. *"My whole family worked as sea captains, engineers or deckhands, so I didn't really consider doing anything else. But the money and getting six months leave every year were also factors."*

After completing a nautical education, he later ventured into offshore as a captain on anchor handling tug supply (AHTS) vessels. There, his 20 years of fishing experience became particularly relevant: *"On an AHTS, using massive winches and high-tension cables to tow rigs, a captain must be keenly aware of the forces and tension experienced by the vessel, an ability I had already acquired aboard trawlers."* A trawler captain's wide-ranging skills and ability to make split-second decisions also played in Sigmund's favor.

Sigmund confirms that life at sea isn't always conducive to a good home and family life. *"When I started, I was at sea 330 days a year and you needed a very good reason to take time off."* Although this has changed, his advice is nevertheless to acknowledge that whereas a captain may be the boss at sea, his wife is always the boss at home.

Sigmund's family focus was also the reason for his latest career move, becoming an offshore trainer based onshore. He needed to *"spend more time with my wife, son and two daughters,"* – a big move, involving relocating from Norway to Perth in Australia. In addition to improving his domestic situation, it's also been a professional success.

"I teach on offshore and ECDIS to both industry novices and veterans, meeting new people every day. It's another way to do the job I did in the North Sea, in a new country and culture, and I enjoy it."

And Sigmund's professional memory to share with his grandchildren: *"Maybe that I helped move what was then the world's biggest rig, Deep Sea Atlantic"* (Odfjell's ultra deepwater and harsh environment drill rig).

A CAPTAIN'S WORK

So how do our two captains' working lives compare and contrast?

CRAIG L. THIGHE

SIGMUND HAMMERSLAND

WORK & LEISURE

The pilot's work rotation depends on the type of flying they do. A corporate pilot could have just a few days off a month or a whole month off at a time. The longest long-haul flights, e.g. 8,575 miles from Sydney to Dallas, can take 16 hours. These trips can last up to a week or more. Short-haul flights can last anywhere from 30 minutes to three hours. Medium haul is defined as three to six hours.

An AHTS vessel works a four-week "swing," during which it can be in port up to seven times. A typical voyage for an AHTS in the North Sea is from harbor to a rig, do the disconnect, tow the rig to a new location, reconnect and sail back, which normally takes a few days. A tow from the North Sea down to Africa or Australia could take four weeks.

TEAMWORK

Most current aircraft utilize two crew members, and for long overseas trips a second full crew may be on board to relieve the flying crew when they reach their duty time limits. If you're flying for a corporate or private operator, you'll usually work with the same crew. If you're working for an airline, your crew rotates as your schedule changes. We use standardized training, checklists and flows for consistency.

An AHTS vessel may have around 18 crew: four on the bridge, four in the engine room, six on deck, and two in the galley. Then there are three trainees, one each for engine, bridge and deck. The crew will typically only be a third of the entire workforce onboard, which can number up to 60. We usually have a stable crew, but because of all the new buildings, crews are being taken from several vessels. Good teamwork is essential for anchor handling.

SAFETY

Aviation poses many safety challenges. The captain's role is to identify and manage potential safety issues. In the airline world we are always concerned about terrorism, especially after the September 11th attacks. Most aircraft have traffic/collision avoidance systems built in, but pilots are still responsible for "seeing and avoiding" and we do extensive safety training/drills both in aircraft and using simulators.

On an AHTS vessel, it's always safety first. You need to do proper risk assessment, you need work permits; there is a system for everything safety related. There are two critical safety aspects, deck work (for crew risk) and when we have a lot of tension on the winch (ship risk). When you have tension on the ship, it's part of the risk assessment - you need to show the oil company that you've done your stability calculations. The tension loads when you tow a rig are up to 130 tons, but when you do anchor handling, when you prelay, we tension the anchors up to 400 tons of torque.

COMMON CHALLENGES

Fatigue and complacency are big issues for pilots and something that the Federal Aviation Administration and industry are working to address. Flying can be repetitive and with automated systems it is easy to get bored. Stress is another a big factor for pilots, especially when weather challenges present themselves. To manage day-to-day stress, pilots have to develop their own habits and strategies, such as personal checklists and relaxation techniques.

Fatigue is a challenge on an AHTS vessel when you do a rig move, as you are usually always on call and it's not possible to get enough rest. The captain especially is always on watch. His responsibility for managing a large crew and a set of high-tension cables and winches can create a fairly stressful situation sometimes. But when you have more experience, you become more relaxed about it. AHTS captains also have special weather and sea-state challenges. When connecting and disconnecting a rig, safe limits are 30 knots of wind and three-point-five-meter wave height. But if you are towing a rig and a hurricane blows up you have to tow regardless. You then have an emergency backup, e.g. detouring into fjords to wait out the weather, if the weather forecast predicts more than seven-meter significant wave height.

CRAIG L. THIGHE

SIGMUND HAMMERSLAND

RESPONSIBILITY & REWARDS

A corporate captain is responsible for the safe operation of the aircraft and management of crew members and also has final authority for the flight. A corporate captain earns around USD 125,000, an airline captain up to USD 200,000.

Besides excellent boat-handling skills, an AHTS captain has to manage his deck, engineering and bridge crew, ensure procedures and safety, do all the administration and maintain communication with both client and shoreside management. Of course, you have to delegate some of this to the Chief Officer. An AHTS captain's salary varies regionally. In the North Sea it's between USD 130,000 and 200,000; in Australia it's around USD 240,000.

TECHNOLOGY

Newer aircraft are usually fitted with electronic flight bag capability, which provides the operator with a full set of digital/electronic charts. We use flight-planning/routing software to help determine optimal routes and for fuel optimization. Most aircraft are equipped with weather radars for making tactical weather decisions. Aircraft that have a weather data subscription allow us to look at weather along our route of flight and make strategic decisions before we reach our destination.

Technology onboard AHTS vessels is always top of the range. Farstad has decided to have ECDIS on all its vessels, even those below 3,000 tons, and is actively transitioning its mariners over from paper charts to ECDIS. Weather data technology is especially important when an AHTS does a rig move. The captain will usually source data from two different suppliers and supplement this with his own calculations, updating and analyzing this every six hours. He also makes frequent use of routing software and voyage/fuel optimization technology, in accordance with the oil companies' efficiency and safety vetting routines. For ship-shore communications an AHTS uses satellite phones and email, and sometimes MF, HF and VHF.

POWERED BY NATURE

Air captains can use the jet stream to fly faster, but it also slows them down when eastbound, especially in the winter. The extra speed/resistance is somewhere between 80-140 mph.

AHTS captains always make use of ocean currents, especially when doing a rig move. In the North Sea and West of Shetland, the current heads north, from half a knot up to four knots, so we use the Gulf Stream. You have to work with it, but sometimes it works against you as well. One knot of current is like 10 or 12 knots of wind.

CRAIG L. THIGHE

Research solutions strategist, Jeppesen Digital Aviation. A pilot for over 15 years, Craig has flown more than 150 different aircraft, logging 3,500 flight hours. He is a CFI, CFII, MEI, ATP and holds an HS-125 type rating. He is also a Designated Pilot Examiner (DPE) and Gold Seal Flight Instructor. A Jeppesen employee for the last 12 years, Craig currently supports the Market and Solutions Research team working on the next generation of aviation solutions. Craig has captained Learjet 35 and Hawker 700 corporate jets of around six metric tons and with a price tag of $3.1 million.

SIGMUND HAMMERSLAND

Offshore instructor, Farstad Shipping. Sigmund has 28 years at sea, 20 as a captain, and received his Deck Officer Class 1 in 1997. As captain on trawlers and AHTS vessels, he has experience from West Africa, the North Sea and the Norwegian Sea. An offshore instructor since 2008, Sigmund is now based at Farstad's Offshore Simulation Centre in Perth, Australia. He has captained AHTS vessels, which are generally on long-term charter or spot charter to oil and offshore companies. Norwegian sector AHTS vessels are between 4,500-7,000 tonnes with price tags of $100-180 million.

Couch sailing

TV coverage of elite sailing has always lacked the adrenaline rush of being aboard a yacht sailing fast in strong wind. Until the advent of augmented reality, that is.

Now, a seamless mash-up of computer graphics and live video feeds is making sailboat racing a thrilling spectator sport. It shows you the real boats and crews, as well as their tracks through the water, course boundaries, wind direction, speed, and other things that significantly affect the outcome of the race. At a glance, you can tell which boat is ahead and by how much, how its main competitors are doing, and whether they are trying different routes and tactics.

The use of augmented reality for elite sailing started with the 2013 America's Cup, in San Francisco. The man behind it is world-renowned navigator Stan Honey. Along with colleague Ken Milnes, he developed an augmented reality solution for the America's Cup Event Authority that allows fans to monitor the events live on TV and mobile devices. You can see the world's top sailors making high-speed maneuvers in powerful vessels with sail-wings 12 stories high.

"The magic really happens when we combine position information from sensors aboard the boats with the video and camera position data from helicopters following the action," explains Honey.

Honey and Milnes are experts in applying augmented reality to broadcast sports, such as their yellow first-down line in televised American football, the tracking system used in NASCAR and other motor races, and the ESPN K Zone system used to track and show a baseball's path.

Their America's Cup system, called AC Liveline, tracks vessels to within two centimeters, 10 times a second, superimposing graphics on the live race footage shot from HDTV cameras mounted on each boat , as well as the race helicopter. This involves integrating ship sensors and telemetry systems, and custom writing software. The America's Cup race management team will also use the system's two-centimeter accuracy to enable umpires to make more accurate decisions.

AC Liveline utilizes Expedition software, widely recognized as the best tactical sailing and navigational software for high-performance offshore racing sailboats,

C-MAP 4D CHARTS:

http://e1.no/54d

RACE AUGMENTED REALITY VIDEO:

http://e1.no/5rAR

THE AMERICA'S CUP

The America's Cup tradition started in 1851, when a boat named America won a race around the Isle of Wight in England. The winning team named its trophy the America's Cup and donated it to the New York Yacht Club. The race has occurred every four to five years since, with a few longer and shorter intervals, and it is always between the current holder of the cup—the "defender"—and a single challenger. Since 1983, that challenger has been determined before each match in the Louis Vuitton Cup race series, in which national teams compete for the right to challenge.

In the in 2017 contest, Team Australia's AC45 catamaran, skippered by Olympic Gold Medallist and ISAF Rolex Sailor of the Year Mathew Belcher, will compete against the defender, Oracle Team USA.

which in turn uses Jeppesen's C-MAP MAX and 4D electronic charts. Expedition's owner/developer Nick White, himself a Volvo Ocean Race navigator and Whitbread winner, says the C-MAP charts are important for displaying course weather and currents and setting the course marks – and are also used for fleet monitoring.

Honey explains how the America's Cup operations centre and committee boat used Expedition and C-MAP charts as a critical background to set and view mark and boundary locations, check currents and wind, and to monitor race boat location and predict their finish ETA. C-MAP charts also provided reference positions for calibrating the augmented reality solution.

The 35th America's Cup in 2017 will be exciting, says Honey. The Hamilton Island Yacht Club has long since announced its Australian Challenge to the defending Oracle Team USA of Golden Gate Yacht Club, San Francisco. But beyond confirming that the race will be an augmented reality experience again, Honey refuses to predict the outcome.

STAN HONEY

Stan Honey is director of technology at the America's Cup Event Authority. A two-time Emmy Winner for Technical Innovations in Sports TV Broadcast, Honey co-founded Etak Inc., the company that pioneered vehicle navigation systems and is now part of TomTom. He holds eight patents in navigation technology and 21 in tracking and television special effects. Honey is also a top-ranked professional sailor, having navigated ABN AMRO to victory in the 2005-2006 Volvo Ocean Race and Groupama 3 in setting the Jules Verne record for the fastest circumnavigation of the world under sail in 2010.

Captain-to-Captain

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Mastering the Waves

A fix on the future: Next-generation leaders, technology and WIGs.

Andreas Sohmen-Pao

BW Group CEO Andreas Sohmen-Pao weighs his words carefully and delivers them with humble conviction. With credentials ranging from Goldman Sachs, the London P&I Club and the Maritime and Port Authority of Singapore – and a profound knowledge of shipping as a third-generation member of the family behind the BW Group – he is a man the global shipping community listens to.

Why have you chosen two of the world's top five maritime capitals – Singapore and Oslo – as hubs for your business?
Some maritime clusters have developed by historical circumstance and others through proactive shaping by governments. As a result of these forces, some centers now stand out, amongst them Oslo and Singapore. We became more involved in Oslo though the acquisition of Bergesen – a large Norwegian shipping company – 10 years ago. We chose to keep a presence there because we see a strong maritime cluster with a lot of the competence we're looking for, in gas and offshore for instance.

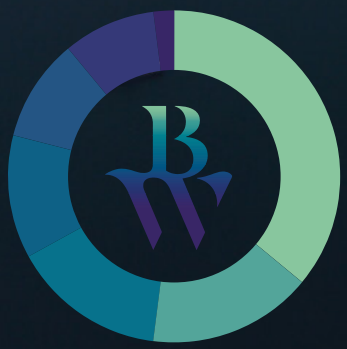
Having said that, we see a much more proactive and welcoming attitude by the government here in Singapore, which I think approaches the maritime industry in a thoughtful and constructive way. And as a result of this, Singapore has been able to attract some of the top maritime and offshore companies, including some of our customers, the oil and gas traders. This makes Singapore a great place to be from a maritime perspective.

One element of the Singapore government's approach is creating a stable, long-term fiscal framework that gives companies visibility on how they will be treated from a tax perspective. This is very important when we're investing in long-term assets. We've seen in other places that changeability and volatility in tax policies make it very difficult to sustain a business. But Singapore has gone further by focusing on generating the right talent for the industry and supporting R&D with funds. Overlaying all of this is a willingness to listen and to take a collaborative and constructive approach. Singapore walks a balanced line between understanding and enforcing the regulatory role of government whilst listening to good ideas and being willing to make changes where required.

BW GROUP

Operates a fleet of 113 owned, part-owned or controlled vessels including tankers, LNG and LPG carriers, and FPSOs. World-Wide, founded in 1955 in Hong Kong by Sir Y.K. Pao, became the world's largest shipowner by 1979. Helmut Sohmen became chairman in 1986 and took over Norway's Bergesen in 2003 and rebranded firm as BW.

BW GROUP'S FLEET



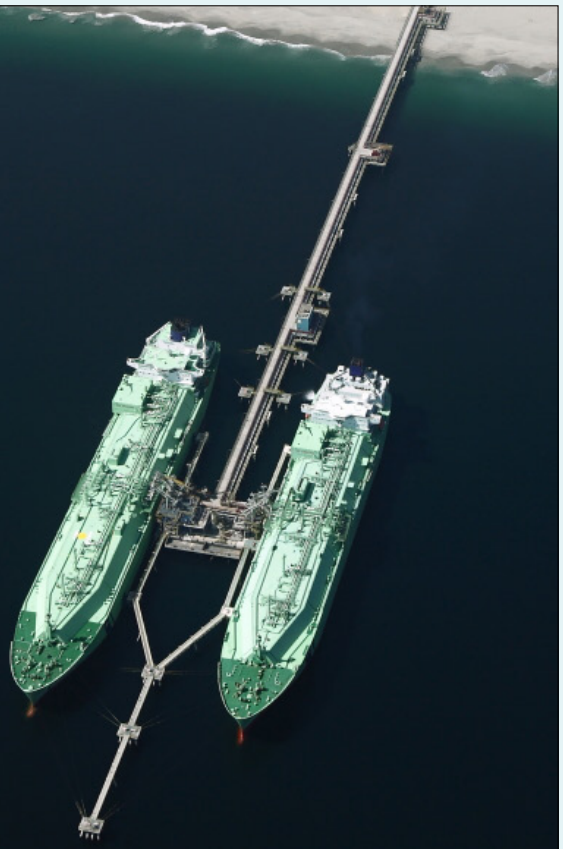
113 VESSELS

- **40** LPG Vessels
- **18** Offshore Fleet
- **17** Product Tankers
- **14** LNG Vessels
- **12** Acquisitions and Newbuilds
- **10** VLCC
- **2** Chemical Tankers

FLEET'S CAPACITY

11,178,449 Total CBM

8,333,979 Total DWT



You are seen as something of an advocate of young maritime professionals. How important is young talent for your business?
Getting the right talent has always been a challenge and will remain so. Of course, computers and electronics have changed the shipboard environment, while regulations and customer expectations are constantly increasing. Therefore, a captain or a chief engineer now needs to be more than a competent navigator or technician – they must also be able to deal with customers, handle documentation and computers. So today we do need a versatile person on the bridge who also has underlying seamanship. In the office we still need good commercial, financial and engineering skills. I'm not sure there's been a huge shift in core skills, although the world is becoming more complex with a rise in the speed of information and capital flows.

At BW, we're fortunate in having a good reputation that brings people to us, but we also have robust recruiting processes. It's vital that we put the right skills and attitudes together to create the right team. Being a dynamic group, constantly investing in ships and companies and developing new business areas, creates a stimulating work environment. In addition, we work to get the soft factors right too, like having a positive culture.

We rotate people at all levels of the organization. For example our head of commercial used to be our head of fleet management. We run internship programs to bring in young recruits. We invest heavily in training for our sea staff. There's no single formula for creating the right talent base and team, but rather a blend of many factors.

BW has initiated a number of innovative, multi-party collaborations. Why is this part of your strategy?
Well, we don't have unlimited resources so we need to invest in the right areas and the right technologies. But it all starts with sharing ideas.

We've put together a few different coalitions. Sometimes, it's simply co-investing in research, which we've done in the past with other industry participants. Sometimes, it's pulling together different industry participants to work on a particular area – for instance, energy efficiency – where we think that having several stakeholders or different points of view will yield a better answer than just trying to do it from one industry angle. For instance, to bring together a classification society, research institution, engine manufacturer and industry participants from different sectors can be a good model for finding new answers.

Another example of our risk-and-reward-sharing strategy is our recent IPO in the LPG sector, where we're actually very positive about the outlook but sold down some shares. On the one hand, we've been investing very heavily in anticipation of significant demand changes. But we're also conscious that sharing risks and rewards with other investors is a way to balance our portfolio, so that we're not over-exposed in a particular segment.

What are the keys to managing a fleet as large and diverse as BW's in an optimal fashion: voyage optimization, fleet deployment, power management?

ANDREAS SOHMEN-PAO

Andreas Sohmen-Pao is CEO of BW Group and a director of BW Offshore Ltd. He is a non-executive director of the Hongkong and Shanghai Banking Corporation Ltd, the Esplanade Co. Ltd and National Parks Board (Singapore), a board member of the Singapore Maritime Foundation, and a member of the Singapore Sports Council and the Singapore Symphony Orchestra Council. Sohmen-Pao previously worked at Goldman Sachs International in London. He has served as a director of the London P&I Club and the Maritime and Port Authority of Singapore amongst others.

The most important factor today is fuel efficiency, which is one of our major focus areas. We have an integrated approach, working on multiple work streams in parallel. They include hardware, coatings, hull cleaning, engine tuning, voyage planning and culture. The latter is critical because even with the best hardware and systems, efficiency often comes down to the action of the individuals on board. We're strong believers that all these factors have to be treated together, because if you only address one, you don't get its full benefit because all the other factors impact it.

So we still depend heavily on the skills of our people on board. Of course, we're working on improving our predictive maintenance and to understand what's going on on board the ship. As technology progresses we'll see the industry focusing more on getting a better picture of performance by collecting ship information electronically and using data analysis. But today, and I suspect for quite some time in the future, much of that is down to the skills of the engineer on board. An analogy is driving a modern car with a computer that gives you warning signals. Sometimes these are wrong because there's a malfunction. It's a glitch and it says your tire pressure is low but your tires are actually fine. Likewise, you may get no warning signal but hear a strange noise from the engine and know something's wrong.

The human being is the most sophisticated computer in the world when we use all our senses, skills and knowledge to address optimization and problems. That's not to say we shouldn't employ technology and computers, but we shouldn't underestimate the human element. People talk about crewless ships, which is an interesting concept but I'm not sure I'll see it during my career.

The maritime world is becoming increasingly interconnected; your business and what happens at sea doesn't just stay at sea anymore. Is the industry moving into a new phase of transparency, where everything's in the public domain?

We've tried to practice transparency throughout the company's history. There was a period when people thought if something went wrong you could remain almost invisible, close your eyes and hope that it went away. I think there is a realization that you can't do that today, because things are very visible and are also commented on very quickly and widely beyond the traditional press.

We deploy all the requisite measures in terms of ethical and business standards. These are ingrained in our way of doing business. Even with all the visibility in the world, some companies still operate unethically, cutting corners or trying to find shortcuts to win contracts and save on operational costs. Transparency is not really an issue if you are acting in a responsible manner. Having said that, the real moment of truth is often how you respond to an issue when it arises.

So, the combination of visibility and the ability for people to share their views in public makes it more important than ever to be willing to stand up, be accountable and act responsibly.

ECDIS: The Next Generation

Many shipowners and operators have now found their feet in the transition to navigation with ECDIS and ENCs. Some also know that it's not just about technology and training bridge crew but also involves company-wide ENC management know-how and procedures. The smart ones also understand ECDIS is a keystone for seizing the opportunities offered by e-Navigation.

As e-Navigation technology develops, it reveals new ways to generate operational gains in areas such as fuel efficiency and route optimization, gains that promise swift returns on ECDIS-related investments. This promise should be just the encouragement the shipping world needs to really push ahead with ECDIS implementation.

So why has skepticism arisen again, and why all the talk about a new generation of ECDIS and ENCs? Will today's hardware, software and charts become obsolete, as some fear?

THE S-100 GENERATION

As Paul Elgar, Jeppesen's OEM strategic business manager explains, the cause for concern is the IMO's new S-100 hydrographic data model and its associated IHO S-101 product specification for ENCs, both of which come into force in 2016.

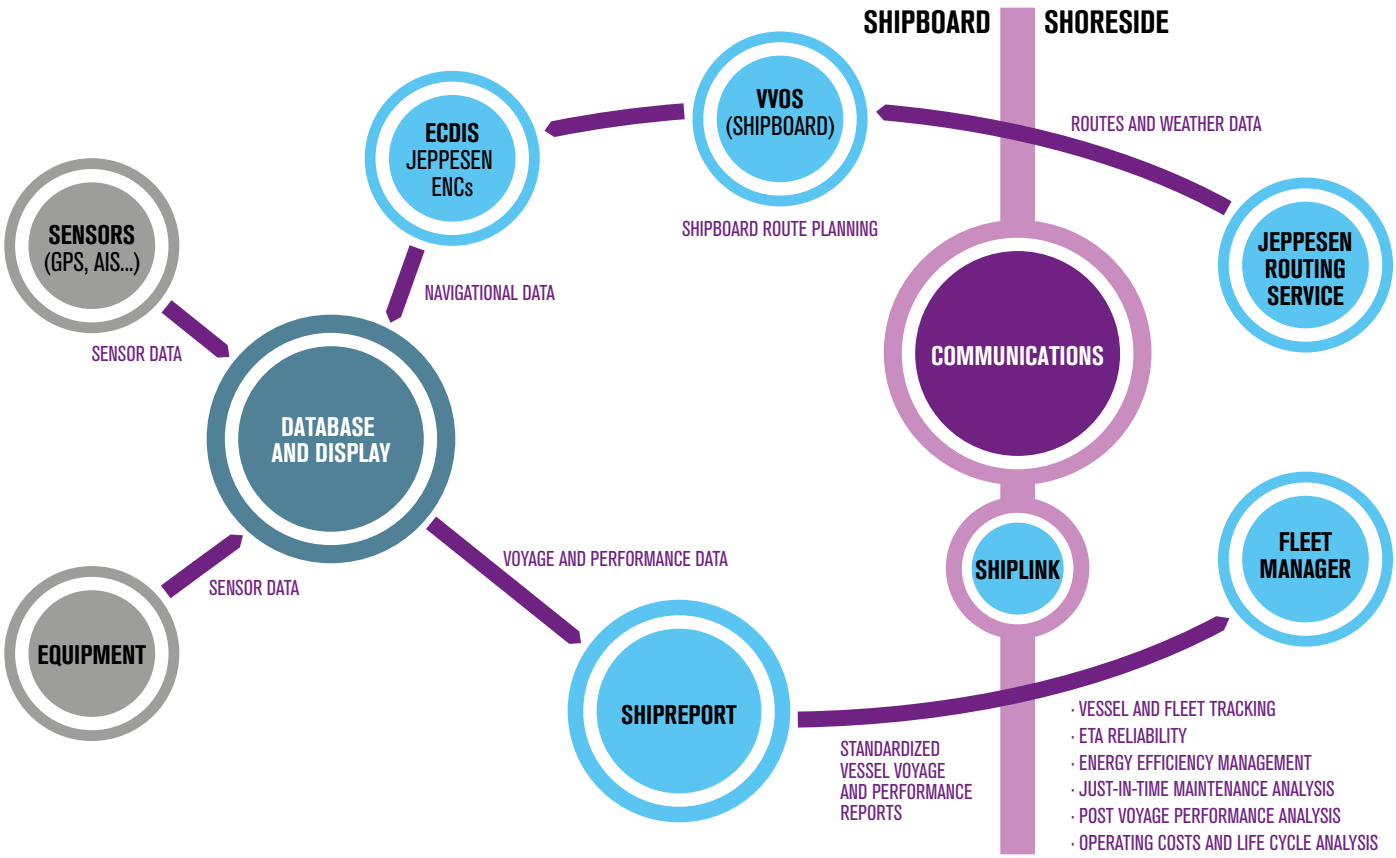
He says that shipowners who know S-100 is coming are worried that buying an ECDIS now could be like buying a 2014 car model – when you know it will be replaced by a new one at the end of the year.

"The new specifications require ECDIS manufacturers to develop new systems," Elgar confirms, "Some will start in late 2014, and Jeppesen will support them by delivering a new, multi-platform ECDIS kernel that ensures they comply with all new specifications and can supply the advanced functionality that users increasingly want." He predicts S-100 compatible ECDIS systems will be on the market by late 2016.

Similarly, the IHO S-101 product specification for ENCs means HOs must begin producing a new type of next-generation ENC that integrates richer information. "To kick-start this process, we have produced an S-57 to S-101 converter to support hydrographic offices producing S-101 chart data," explains Elgar. "These S-101 ENCs will form the base navigation layer for S-100-enabled ECDIS, but their true potential will not be realized until additional product specifications are developed to interact with S-101." Richer data capability is a major benefit of the new specifications, allowing the introduction of additional features not available in the current data formats. The IHO has approved work on product specifications for high-resolution bathymetry and nautical publications. Other potential S-100-based product specifications may include real-time tidal information and port operations information.

WHAT ARE THE ADVANTAGES?

Michael Bergmann, CIRM president and Jeppesen maritime industry director, says that S-100 and S-101 "will solve the cause of the infamous ECDIS anomalies, the discrepancy between the ECDIS rendering engine and its encoding of the



data." He adds that they will also enable a regular updating process that ensures the future quality of ECDIS software.

As part of the IMO Strategic Implementation Plan (SIP), Jeppesen is collaborating with the Korea Maritime and Ocean University to create a software quality assurance system which Bergmann calls "essential for ensuring the interoperability of systems that e-Navigation depends upon."

Another major benefit of S-101 is the ability to introduce additional features not available in S-57 ENCs. The IHO has approved work on product specifications for high-resolution bathymetry and nautical publications. Other potential S-100 based product specifications may include real-time tidal information and port operations information.

JJ Ung Gyu Kim, CEO at Hyundai e-Marine, currently developing an S-100-compliant ECDIS and an augmented reality navigation system to visualize S-100 navigational information, emphasizes that "Next-generation ECDIS will be able to integrate all types of chart data and information from other navigational equipment in real-time and portray it via web and mobile applications."

CAREFUL TRANSITION

Reassuringly, the IMO has proposed a phased development approach with a transitional change to the new standard. Some industry experts say this also helps clarify the development track towards e-Navigation. First-generation ECDIS will go "enhanced" (compatible with more devices), then ECDIS will become part of INS (Integrated Navigational Systems), where all devices on board are networked and different platforms speak to each other in common language; followed by fully fledged e-Navigation with industry-wide exchange of data and information between all key maritime stakeholders.

THE MARITIME CLOUD

The e-Navigation vision of industry-wide digital integration is supported by the S-100 standard because this is fully aligned with mainstream international geospatial standards, in particular ISO 19000. Equipment manufacturers can then use a common data protocol, simplifying the interconnection of ECDIS systems with other equipment, such as engines, fuel flow meters and torque meters. Industries such as commercial aviation and power generation have already moved to common open standards data protocols.

In addition to standards, e-Navigation needs an infrastructure providing authorized seamless information transfer on board ship, between ships, between ship and shore and between shore authorities and other parties. This would enable, for example, navigators to provide vessel information to a port authority at the push of a button - substantially simplifying reporting work.

Krystyna Wojnarowicz, co-founder of MARSEC-XL, the marine software engineering cluster of excellence, supports this approach, as "Enabling the Internet of Things at Sea for maritime operations will require a unified approach to software system architecture. Smart, sensor-enabled devices will have to be connected in networks to form a seamlessly interoperable 'maritime eco-system.'"

The Danish Maritime Authority, an avid supporter of e-Navigation, has proposed the Maritime Cloud, a cloud-computing solution providing access to information located on servers around the world. Wojnarowicz says a cloud solution based on open IT architecture will increase innovation and competition, enabling reuse of components, facilitating rapid technology introduction, and reducing maintenance needs. The IMO is working on policy for implementation of the Maritime Cloud as a gradual transition and replacement of existing infrastructure, procedures and systems.

As a stepping stone towards a future of smart ships and an interconnected industry, S-100 will be a litmus test of the maritime community's appetite for broad stakeholder collaboration and innovation. Welcome to the next generation!

What's a WIG?

Is it a boat? Is it a plane? No, and it's not Superman either. But it does float like a ship, glide over land and water like a hovercraft and fly like an aircraft.

Welcome to a vessel type that may well revolutionize sea transport and goes by the unlikely name of WIG. "Wing-in-ground-effect" (WIG) craft have had a long and painful birth and are still relatively unknown.

Developed for military use by the Soviet Union in the mid-1900s, the first WIGs disappointed, as they couldn't fly high enough. Now, eleven countries, including the USA, Japan, Russia, and Australia, are exploring their civil and military use. A South Korean-developed 50-seater WIG is ready for commercialization.

The renewed interest is hardly surprising when you consider WIG craft attributes: faster than any boat; cheaper to construct and operate than aircraft; fly over water, sand dunes, swamps and ice; need little or no infrastructure and can embark from/dock at any port; transport passengers and freight of up to 50 tons in weight; no pilot's license necessary; high maneuverability; low fuel consumption and emissions.

GREEN TRANSPORT

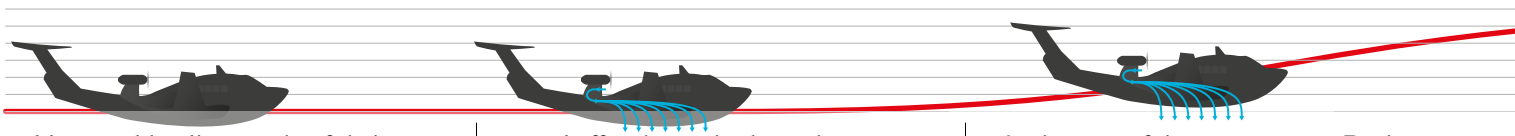
This remarkable craft resembles a seaplane but is categorized as a ship and crewed by mariners. It skims over water at a height of around four meters and up to 200 km/h, some three to five times as fast as a ship. With superior aerodynamics giving fuel consumption approximately half that of comparable aircraft, WIGs are being proclaimed the "next generation of green sea transport". They certainly appear to be a safe, fast, ecological and convenient transportation option that can set completely new standards, closing the gap between cheaper but slower ships, and faster but more costly aircraft.

Resting on an air cushion created by streamlined wings, a WIG functions on the same principle as the hovercraft, but its speed, range and maneuverability give it much greater commercial potential. WIGs are safe and simple to operate too, needing little effort to control thrust, flaps, elevators and


WING SHIP

AIR-CUSHIONED FLIGHT

WIG craft like the WSH-500 are propelled on an air cushion of dynamic pressure created by their streamlined wings. The airflow stimulates thrust and also acts as an automatic stabilizer when the machine is flying close to the ground or over water. Hovercraft use the same principle, though whereas they blow air downward to create an air cushion, WIGs utilize natural air flow generated by forward movement and are thus much more efficient.



rudders, and landing gently of their own accord if engines fail. They also return to the original altitude or pitch without any pilot control when disturbed by high winds. The IMO accepts experienced marine officers as pilots.

WHAT IS "GROUND EFFECT"?

WIG craft exploit an aerodynamic phenomenon known as the "wing-in-ground effect" that reduces drag and fuel burn. Flying close to water (or land, if there are no obstacles), the wing downwash angle and tip vortices created by normal aircraft in flight are suppressed, resulting in a major drag reduction and outstanding cruise efficiency.

The ground effect was first recognized by Leonardo da Vinci, who observed how easy birds glide close to the ground. Flight pioneers the Wright brothers benefited from the effect without even knowing it existed – their first, low-power craft most probably never rose above its influence. In the Second World War pilots knew that they could limp home with engine damage or low fuel by flying just a few meters above the sea.

FROM MESSERSCHMITTS TO PELICANS

The design of a craft for exploiting ground effect began in the early 1960s with Dr. Alexander Lippisch. An aerodynamics genius, he was the brains behind the World War II rocket aircraft Messerschmitt Me 163 and developed the delta wing, vital for both WIG craft and supersonic flight.

Lippisch's first two-seater WIG, built in the USA in 1963, was equipped with reversed delta wings. They produced dynamic pressure, creating thrust and an air cushion for reducing resistance and stabilizing the craft when flying close to the ground or water.

In 1966, Lippisch partnered with Hanno Fischer, whose company excelled in glass-fiber-reinforced plastic for aircraft construction and had facilities for further development of WIG craft.

Russia was also investigating ground effect in the 1960s and built the 540-tonne "Caspian Sea Monster" (known as *ekranoplan* in Russian), the largest WIG craft ever. Measuring 106 meters in length, with a wingspan of 40 m and massive 22 m tail to aid stability, it was capable of speeds of up to 500 km/h. Built by the Soviet Central Design Bureau of Hydrofoil Vehicles and powered by 10 turbofan jet engines, it was destroyed in a crash in 1980.

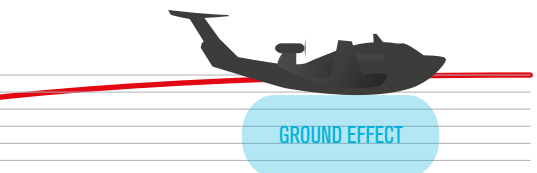
At the turn of the 21st century, Boeing considered building the largest plane ever, a WIG colossus called the Pelican Ultra Large Transport Aircraft (ULTRA). Measuring 152 meters from nose to tail, with a wingspan of 109 meters, it could fly 1,400 tonnes of cargo 10,000 nautical miles over water and 6,500 nautical miles over land in one journey. However, it remains on the drawing board.

FROM GERMANY TO SOUTH KOREA

After 50 years spearheading German WIG craft technology and know-how, Lippisch signed his Hoverwing technologies, including several related patents and technical data, over to the Korean Wing Ship Technology Corporation (WST), becoming their consultant in 2009.

B.J. Kang, head of WIG technologies at WST, explained how they have since designed new fuselage, propulsion and control systems and manufactured an extremely light craft. WST tested the WSH-500, which can carry about 50 passengers or 4.3 tonnes of freight, in 2013. He calls the craft "a technology of integration and a big first step towards a huge market for a novel form of transportation."

The WSH-500 received its main



construction certification by Lloyds Register in late 2013, and the certificate for machinery and equipment is scheduled for late 2014. WST already has an order for a military WSH-500 for the Korean navy, and Kang expects to see the first 50-seater WIGs in commercial service in late 2015 or early 2016.

FROM R&D TO INNOVATION

The Korean interest in WIG vessels began in 1990 when the Korea Research Institute of Ships and Ocean Engineering (KRISO) did R&D on several kinds of high-speed craft (hydrofoils, aircushion vehicles, WIG craft and hybrids). In 2007, the Korean government supported the establishment of Wing Ship Technology Corporation (WST) to develop and commercialize WIG craft developed by researchers at KRISO.

Keen to see the WIG revolution take off, the Korean government created regulations for WIG craft construction and amended the rules for marine traffic (COLRegs), and ship management (ISM) so WIG craft could be smoothly integrated into the maritime environment. Kang explains how the WSH-500 can reach all of Korea and its surrounding islands within one hour and China and Japan in one to three hours. He says the government is "actively fostering WIG craft as the future mode of transportation to China and Japan and because they are highly safe and eco-friendly."

HIGH-SPEED FERRIES AND OSVs

WST is now looking for investors to roll out the WSH-500 as the new solution for the high-speed coastal ferry and offshore supply vessel segments. It is three times faster than traditional crew boats and speed ferries, and its does away with seasickness problems and the noise and vibration of helicopter travel.

A WIG's high maneuverability and speed also make it ideal as a sea rescue craft or for bridging the infrastructure gaps in developing countries where waterways are often natural traffic arteries.

According to Kang, the main barrier for rapid uptake of WIG craft is skepticism: "The hydrofoil has been the fastest seagoing vessel for nearly 40 years, but the market needed to develop something faster and more efficient. Some think faster means more dangerous, but at sea, slow speed is more dangerous, as it creates crew boredom and impairs ship control," adding "Nothing about WIG craft is difficult, just different!"

WSH-500 (50-SEATER)

WST completed manufacturing the first WSH-500 carrying about 50 passengers or 4.3 tons of freight at once.

Speed (top/operational): 105/95 knots

Size: LxBxD = 29.1 x 27.2 x 7.5 m

Maximum Take-off Weight: 18 metric tonnes

Wave height limits: 1.5 m normal take-off/landing, 2.5 m extreme landing case

Fuel consumption: 450 kg/hr

Range (nautical miles): 160NM (Max. 530NM)

Passenger capacity: Max 50 passengers

More information: http://wingship.com

SEE WIGS IN ACTION

http://e1.no/5wig

Industry insider: Michael Bergmann

As president of CIRM, the international association for marine electronics companies, a representative on various IMO, IHO and IALA working groups and a regular speaker at e-Navigation events, Michael Bergmann is deeply involved in commercial marine industry issues.

We asked him to share some insights on a few of the critical issues and mega-trends affecting the maritime world.

HANDLING CHANGE AND INNOVATION

The world has moved from the industrial age to the digital age and lately the term "shift age" has been used to refer to our migration towards a world of constant, rapid change and increased "connectivity" and "availability." The speed of innovation has increased tremendously in the last 10 years and exponentially in the last 50 years. Rapid and sometimes drastic changes have made innovation a permanent requirement for most industries. In the maritime world, the inception of e-Navigation is a prime example of how to preempt and address critical innovations in a structured manner with broad stakeholder engagement.

Innovation is an integral part of e-Navigation and the concept can only be successful if it balances a need for innovation with that for ensuring the quality and usability of any change in technology or processes. Constant innovation will also change how performance standards are handled. It is widely understood that the current ECDIS performance standard is restricting innovation, as its updating and certification concept is not geared to meet the needs of e-Navigation. This is now being addressed in the IMO's adoption of the IHO S-100 hydrographic data model as the basis for the Common Maritime Data Structure (CMDS) in e-Navigation.

UNDERSTANDING COMPLEXITY

Increasing complexity and interrelatedness is another mega-trend the world is facing. In order to carry out essential tasks, we have to quickly familiarize ourselves with new surroundings, circumstances and facts. To do that, we need swift and easy access to more information.

For a mariner, this can be gathering digital chart, weather, piracy and ship performance data in order to re-route a ship faced by a hurricane or other circumstances. For a ship in a clogged shipping lane encountering a newly built wind farm, it may be collecting navigational data such as Virtual Aids to Navigation (AtoN) and Automatic Identification System (AIS) to maintain the necessary situational awareness.

EMBRACING COLLABORATION

Maritime authorities are realizing that they need to adapt to the speed of change as well as to cope with the growing complexity of today's society. With e-Navigation the maritime community is attempting to master this situation. The working groups and committees of inter-governmental organizations like the IMO and IHO are increasingly involving non-governmental organizations like IALA and CIRM as well as industry partners, well aware that they are more versed than public bodies in handling innovation and managing change. A growing number of maritime companies are participating in public-private cooperation and new multi-party alliances, sharing their innovation skills and adaptability experience in order to help migrate the industry towards the "shift age" and address the demands of today's changing maritime reality.

MICHAEL BERGMANN,
CIRM President, Jeppesen Maritime Industry Director

Bergmann serves as a bridge between Jeppesen and key sectors of the global maritime industry, working closely with the likes of the International Hydrographic Organization (IHO), International Maritime Organization (IMO) and International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), to support advanced navigation, efficiency and safety at sea.

An Associated Fellow of the Royal Institute of Navigation and the Nautical Institute, Bergmann was elected as President of Comité International Radio-Maritime (CIRM) in 2013.

Bergmann, who holds an MBA in International Business Administration from the University of Liverpool, UK, and a Masters Degree in educational theory, theology, psychology, sociology, and others from Catholic University of Applied Science in Mainz, Germany, is also a regular contributor to leading maritime journals.

INTEGRATED DATA: THE E-NAVIGATION BACKBONE

As e-Navigation starts to gain traction in various organizations and the concept develops, the importance of integrated data, both static and dynamic, becomes increasingly apparent. The IALA and IHO, supported by CIRM have proposed the IHO GI Register (or S-100 Register) as the conceptual basis for the Common Maritime Data Structure (CMDS). Utilizing this common understanding of key players in the e-Navigation arena, the IMO e-Navigation Correspondence Group has firmed up the overarching architecture, enabling a series of test beds aimed at verifying the integration of various data streams to enable improved communication between stakeholders on shore or at sea.

The integration of pre-composed, expert-generated navigational data with real time and semi real-time data like Virtual AtoNs, Tide Gages Data or MSI transmission from VTS into a single e-Navigation display, if correctly developed, implemented and executed, will enable increased situational awareness for both mariners and shoreside staff.

The new e-Navigation framework aims to integrate and harmonize a growing number of data streams to create the information vital to increase situational awareness. This is changing the way systems are managed, type approved and more importantly how they handle and render chart data.

HYDROGRAPHY AND CARTOGRAPHY

The e-Navigation scenario will also change how hydrography and cartography interrelate. While the changes in the regulatory framework will need to be developed over time in the IMO, the trend is towards a concept defining the conditions and regulatory requirements while allowing for innovation by avoiding over-specification.

The basis for chart products is currently generated by HOs or associated organizations that conduct surveys to provide bathymetric data layers. Together with information about navigational aids they create the foundation for navigational data. These basic data sets are enriched by information on navigation-related objects as well as procedural and regulatory information needed for a safe passage provided by organizations such as coastal administrations or port masters.

Cartographers then combine this static data to create a chart or publication. They also verify that the data sets do not conflict and compose them for ease of use. The resulting charts and publications are standalone products with no interoperability.

This method was also adopted in the chart-centric paradigm of ECDIS and ENCs. HOs prepare pre-composed ENCs of certain scale bands, which have an intended use and appropriate zoom factors, there by defining the look and feel as well as the appropriate rendering of ENCs in a type-approved ECDIS. Any "value-added data" may form an "overlay" but cannot really integrate with the ENC data.

Today, both static and dynamic data sets are available, but the different data streams may not be integrated as they may come from different sources. Therefore more data does not always result in better information and improved knowledge. It also carries a risk of "data overload." To solve this, the different data streams must be integrated and prepared for use to ensure they reach the mariner as meaningful information. For example, real-time water level information must be combined with static shore information, and static navigational aid information must be combined with AIS AtoN information. In this way, the various data streams will be integrated as a "nautical data collection." Updating of these integrated data streams must also be synchronized to avoid conflicts from misalignment of the various components.

A SMART FUTURE

The ongoing development of electronic cartography in the maritime world has taken a step towards situational awareness and evolved away from simple chart display. This development will intensify and require a change in how digital maritime information is developed, composed and stored. The future demands integrated static and dynamic data streams that support data integration and situational centric rendering.

With this development, a mariner or fleet manager will get the information necessary to ensure a safe and efficient voyage whenever and however it's needed. While all of this is already technically possible and well underway, e-Navigation needs to be supported by a regulatory change from a framework defining detailed implementation aspects to one defining the "What" while allowing innovation to specify the "How" based on state-of-the-art and ever-evolving technology.