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A New Golden Age Of Sailing Is Here: Where Is The Leadership?

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The next decade will see more innovation in ocean-bound technologies than possibly the past 100 years combined.

Advances in low cost private satellites, artificial intelligence, advanced robotics, cloud data storage and communication, are opening up new frontiers in ocean bound transportation. However, a surprising propulsion technology is also making an appearance that could re-disrupt the global shipping industry: wind.

Wind is about to make a big comeback in shipping. New ship designs being experimented with that include a combination of hard sails, rotating cylinders, kites and bubbles underneath the hull show just how radically different large, ocean bound ships could look by 2030.

Wind powered vessels are significantly lower polluting than the heavy fuel oils currently being used in shipping around the world.

Rather than embracing this transformation, regulators are dragging their heels – both internationally and in the United States. In doing so, they are missing the opportunity to widen the economic pie for overall maritime transportation.

The next few years is a unique window to create tens of thousands of new manufacturing jobs around the world, establish innovative new high-tech shipbuilding clusters, transform ship energy systems and radically reduce global greenhouse gases by transporting more goods via internal waterways than by road or air.

Technologies exist today

In road transport, Tesla TSLA -5.9% has confounded all expectations in the past decade by becoming the world's most valuable auto-manufacturer (at $208 billion, overtaking Toyota valued at $203 billion) and spearheading change in the industry by embracing these technologies.

Where is the equivalent in global shipping, an industry that transports 90% of global trade and is the sixth largest emitter of carbon dioxide – greater than France and Germany combined?

The technologies in maritime exist today. It is just the regulators who are now holding back this innovation from growing at scale. As the world grapples with unemployment in the midst of the

coronavirus pandemic, they are also hampering job creation and missing a major economic opportunity.

Ineffective regulators and regulations have held back progress both internationally – the UN's International Maritime Organization that regulates global shipping reneged on earlier promises to reduce carbon emissions – as well as domestically – no discussion of U.S. shipbuilding goes too far without discussion of the requirement that forces all U.S. shipping to be American-built (a 100 year old law called the Jones Act).

This could be a new golden age of wind-assisted shipping. Companies that understand both air and ocean may emerge as winners. These could lead to massive new maritime manufacturing divisions in companies with these capabilities such as Lockheed Martin LMT 0.0%, Boeing BA +0.8%, Northrup Grumman NOC +0.2%, Airbus, BAe Systems in addition to the network of smaller venture-backed companies and university spinoffs driving much of the innovation.

Ship fuel leadership lessons from Winston Churchill

Just over 100 years ago, the then First Lord of the Admiralty, Winston Churchill, made a bold decision to move the British Royal Navy from coal (which was abundant in the U.K.) to oil-powered vessels. A Royal Commission on Fuel and Engines was established to move the industry forward in 1912 on the eve of the First World War.

This decision was largely credited with Britain's Royal Navy establishing a superior maritime dominance in WW1 and WW2 than if they were to have relied on the outdated technology of coal and steam-powered ships, which had been a bedrock of British shipping for a century prior in the Age of Empire.

It was a controversial decision at the time, but eventually led to Britain's establishing a strong military, strategic and competitive advantage in the long term.

The same considerations now face leaders around the world today.

Climate Crisis: why shipping regulations matter

One of the biggest drivers for change is the need to meet greenhouse gas emission targets as part of the Paris Climate Agreement.

In global shipping, this means reducing greenhouse gas emissions per mile travelled by 40% by 2030 to be on track to hit a 2050 target of no more greenhouse gas emissions and align with the 1.5C target scientists argue is needed to avoid runaway climate change.

To achieve this, new fuels will need to be introduced into ships by 2030. The shortlist of such fuels are currently Ammonia, (Green) Hydrogen and Electrification. There are some experimental ideas from Bill Gates around Nuclear-powered propulsion (though the implications of a grounding of such a ship will need to be weighed up as the Indian Ocean island of Mauritius discovered this summer), as well as LNG (which some environmental groups argue have not fully taken into account methane emissions in the production of LNG).

As an interim measure until 2030, ships need to demonstrate they can improve their efficiency per mile by 2-3% a year to stay within the Paris Agreement measures. This is why wind-propulsion is so important, and why regulations matter. UK-based industry body, the International Windship Association estimate greenhouse gas emissions from wind-propulsion ships can be reduced between 20-30%. Some groups have gone even further and claim wind-propulsion can achieve a 90% reduction in carbon dioxide emissions.

New Biden-Harris Administration

Internationally, shipping emissions are regulated by a UN affiliated agency called the International Maritime Organization, based in London.

The U.S. has an influential 'Tier A' status on the IMO Executive Council – one of only ten nations to hold such a position – and with the new Biden-Harris Administration with John Kerry as Climate Special Envoy, could transform the organization which has been woefully underperforming on all aspects of global shipping's impact on the environment.

The U.S. could also choose to forgo IMO reform and create a network of regional green transport corridors with major international trading partners, as a swifter approach to bring in change, as the EU is pursuing.

In parrallel, the U.S. could look at the role of the MARAD Administrator that governs U.S. Maritime Transport and the Marine Highway network in the U.S. and rapidly develop a plan to reprioritize more cargo moving from road and air and onto U.S. waterways. With the volume of U.S. freight forecast to increase 40% by 2040, making a breakthrough on low carbon transport options will be important.

To succeed the new Biden-Harris team will need a close working relationship with the Maritime Trade Unions and the U.S. Congress in order to find creative ways through the Jones Act and launch a new renaissance in U.S. waterways and shipping – something that President-elect Biden could be uniquely positioned to achieve.

Five exciting wind assisted propulsion projects

Here are some of the most exciting developments in wind-assisted propulsion for the 60,000 large, ocean-bound ships that transport 90% of global trade.

1. Oceanbird's hard sails

Swedish ship designer Wallenius Marine, recently announced Oceanbird, a new cargo ship design using hard sails that they claim could lead to a 90% reduction in carbon dioxide emissions. This new type of cargo ship could cross the Atlantic in 12 days (compared to today's crossings that take 8 days), and be on the oceans by 2024.

Their showpiece transport vessel, has been designed to carry 7000 cars, and small scale models are currently being tested in Sweden. The wing sails are made of a mixture of metal and composite and will be around 80 meters high, twice the height of those on the largest sailing

vessels around today. These retractable sails can be reduced to a height of 45 meters and there will also be engines to maneuver in and out of port, and for emergency operations.

Oceanbird is a Swedish collaborative project between four Swedish maritime organizations: Wallenius Marine (which is fully owned by the Chalmers University of Technology Foundation), KTH Royal Institute of Technology and SSPA independent research institute. It is supported by the Swedish Transport Administration, which is acting as a co-financier.

It is a cluster collaboration with experts from the public and private sectors and academia, and could provide an innovative model for how the U.S. could consider a new blue maritime industrial revolution.

2. Giant kites

Giant kites are being developed by several companies to transform how shipping can be powered. This takes advantage of greater windspeeds at a height much taller than what traditional sails can reach. Some of the biggest investors in this area include French company Airbus and German company SkySails.

The Airbus AirSeas project

AirSeas is an internally incubated company within global aviation giant, Airbus. It brought together environmentally-engaged company engineers with a common passion for aeronautics and the sea. Together, they developed the concept of the SeaWing.

This is one of several companies that are exploring how inflatable kites could propel vessels along more efficiently than just relying on heavy fuel, and achieve significant efficiency savings on each voyage (AirSeas forecasts their technology could lead to 20% fuel savings on each trans-Atlantic voyage). The SeaWing technology relied on Airbus' knowledge of aerodynamics, modelling, flight controls, systems and materials.

SeaWings are mounted on existing vessels and are launched by a switch. The kite deploys, unfurls and operates autonomously, and its system collects and analyzes meteorological and oceanic data in real-time to ensure the kite can perform at its full capabilities. When the towing is not required, SeaWing automatically refolds and is recovered, in preparation for its next use.

Airbus has a fleet of four massive roll-on/roll-off (ro-ro) ships that transports large aircraft parts among its production sites in Europe and to the United States. The French-Headquartered company has now ordered the kite for use on its own vessels. Airbus expects that the SeaWings will reduce its shipping industrial environmental footprint by 8,000 tons of carbon dioxide a year (equivalent to eight times the amount of fuel that was spilled in Mauritius in August).

Beluga Skysails

One of the earliest pioneers in kite-assisted sailing was SkySails. It estimates its kite could similarly reduce fuel consumption by up to 35% by flying the computer-controlled kite at between 100m and 300m altitude.

This is much higher than traditional ship sails, so can provide a similar amount of propulsion with a significantly smaller surface area.

Installed on the 10,000 ton German cargo ship, the Beluga, this vessel was eventually chartered by the U.S. Military Strategic Sealift Command. The cargo ship was also chartered by companies like Rio Tinto and Cargill, showing the influence that large industrial customers can have on shipping companies.

SkySails now has a range of wind-assisted technology offerings, including providing kite-propulsion to super yachts.

3. Neoline's new sail designs

A French consortium came together to form a cargo ship sailing company called Neoline in 2015. Supported by French car manufacturer, Renault through a three year partnership, and several large French shipbuilders, they aim to disrupt shipping with their innovative sail designs.

The company have also had to think about how to overcome practical considerations such as existing bridge infrastructure around the world, by designing masts that can bend downwards when passing bridges close to shore and in waterways.

Neolines have plans to build increasingly larger vessels by 2030, using more advanced sail designs, initially focused on the trans-Atlantic route.

4. Cylindrical 'Rotor Sails'

One of the more unusual ship designs is the use of a cylindrical sails, known as Rotor Sails or Flettner Sails.

This ship designed is based on a 100 year old propulsion technique invented by German Engineer Anton Flettner. These rotor sails use the same principles as aviation to increase lift and propel the vessel forward. This force is called the Magnus effect, and creates a difference in pressure between the cylinders that moves the ship forward. It is estimated to save the vessel 20% in fuel efficiency, and can be added to any ocean-bound vessel.

Several large consortiums are now investing in new Rotor Sails technologies.

This month, ship insurer Lloyds List, Flettner Rotor developer Anemoi and Shanghai Merchant Ship Design and Research Institute (SDARI) came together to refine the design of such rotor sails. Earlier, large ship engine manufacturer, Wartsila, announced plans to start developing such solutions too.

5. Bubble-Hull Air Lubrication

Another way to increase fuel efficiency is by reducing drag in the water. Several companies have realized one way to do this is to help ships float on a cushion of bubbles, a technique known as 'Air Lubrication.'

This reduces drag of the vessel and makes ships significantly more fuel efficient, and helping shipping meet Paris Climate Agreement targets over the next decade.

These technologies can be retrofitted to most large ocean-bound vessels. Such technologies to retrofit existing vessels make an approach to meet the Paris Agreement more feasible, without the need for new ships to be immediately deployed.

Other emerging clean maritime technologies

There are several more clean maritime technologies that could transform the efficiency of global shipping over the next decade. These include:

Ship Weather Routing

Improvements in weather forecasting means that vessels could take more efficient paths than the current shipping lanes around the world, thus reducing fuel and carbon emissions. This approach is known as Ship Weather Routing.
Saildrone

The world's leading company in autonomous and solar powered vessels is California-based Saildrone. They are expanding their fleet of vessels (known as gliders) and are undertaking a wider range of ocean data missions from fisheries monitoring, storm monitoring as well as helping understand the impacts of climate change. Saildrone is a $60 million venture-backed enterprise, and all their vessels are manufactured at their plant in Oakland, California.

Electric Ferries

There are now dozens of electric ferry companies across Europe, transporting people and goods along internal waterways. Much of the advances have been led by Sweden and Norway. China has also been developing electric barges for the transport of industrial materials along its waterways. The U.S., has fallen significantly behind in the deployment of such technologies across its rivers, canals and waterways.

There is a need to build new charging stations, loading and offloading ramps and upgrading the U.S. waterway network. These are the sort of stimulus programs at a Federal and State level that could transform the battle against climate change.

Google X's Makani

New technologies in turbines could provide alternative propulsion options. An innovative wind turbine company spinoff from Google GOOG -0.1%X (renamed 'X' the Moonshot Factory) is called Makani. Makani uses a more advanced cross between a kite and a glider to generate power and is pioneering innovative offshore power generation through its wind turbine technology. The company was invested into by Royal Dutch Shell in 2019.

To use such a deployment on ships would require the redesigning of the hull to reduce the pressure on different parts of the hull under propulsion by a Makani kite.

Where is the leadership?

These technologies show the potential to build a cleaner, more efficient and more exciting shipping future.

Many of the pioneers in this field did not wait for Governments to wake up to the potential. They have pursued these technologies themselves, and identified breakthroughs not thought possible before. There are many analogies with the automotive industry and how companies like Tesla had to battle the powerful, traditional car and oil lobbies in order to introduce new electric vehicles into states across the country.

With the pressure of the climate crisis on Government's around the world, an additional boost could transform one of the biggest polluters in the world – global shipping – while at the same time creating thousands of new jobs. As part of his Presidential Campaign, President-elect Biden already committed to enforceable climate emissions for international shipping.

D.C. Think Tank, the CATO Institute, has identified many challenges with the Jones Act, that emphasizes vessels in the U.S., must by at least 75% assembled and crewed by Americans. They have estimated this has increased the cost of vessels almost 10-fold (from $30 million in Asia to $250 million in the United States), with the U.S. building less than 1000 ships a year compared with over 70,000 each in South Korea, China and 40,000 in Japan. They have also identified a range of measures that could transform U.S. shipping (such as cabotage services for inland waterways).

Transforming U.S. shipping will require a wholescale upheaval, including training new seafarers on the technologies needed for cleaner shipping, providing industry clusters to build the new foundational technologies needed for clean shipping, incentivizing cargo to be shifted from land to water, as well as taking on big legislative pieces such as the Jones Act and negotiations with Trade Unions.

If the Biden-Harris Presidency is serious about addressing the Climate Crisis, then it cannot hide away from taking on big challenges. Building a more sustainable shipping industry is one of them.

Taking on these big challenges is one of the reasons why Secretary John Kerry was appointed last week as U.S. Special Envoy for Climate Change. Just look at the lessons from the Obama Presidency and how rapidly electric vehicle revolution has now spread around the world.

It is only through such bold measures that the Biden-Harris Presidency will be able to 'Build Back Better.'