Polar research for the planet

As environmental concerns seriously mount, the aptly named RRS *Sir David Attenborough* polar research vessel is about to be launched, opening up new frontiers in climate change research, as British Antarctic Survey director **Jane Francis** explains to **Bob Jaques**.

This autumn will witness a milestone event with the launch of the RRS *Sir David Attenborough* not only the most important commercial ship built in the UK for the last 30 years but also the world's most advanced polar science vessel.

The research ship is being built to a Rolls-Royce Marine (now Kongsberg) design by Cammell Laird and will be operated by the British Antarctic Survey (BAS) on behalf of the NERC (National Environment Research Council), the UK's leading public funder of environmental science. She will replace BAS's two existing vessels, the RRS *James Clark Ross* and RRS *Ernest Shackleton*, specialising in research and logistics respectively.

'The new polar ship will help us to investigate how the polar oceans are regulating our climate and how this may change,' BAS director Prof. Dame Jane Francis tells Seatrade Maritime Review in an exclusive interview ahead of her appearance as Guest of Honour at the Seatrade Awards in London in early May.

'The RRS *Sir David Attenborough* is a state-of-the-art platform for polar science that will help British Antarctic Survey scientists and their collaborators to conduct multi-disciplinary research, which will help make sense of our changing world for the benefit of society.'

'What happens in the polar regions affects the rest of the globe. The ocean around Antarctica, the Southern Ocean, is soaking up a lot of heat and carbon dioxide from the atmosphere and it's being taken down into the ocean. Scientists want to really understand how it is storing that heat and carbon dioxide, where it is storing it and then what is going to happen to it in future.'

It is a little-known fact that the oceans have absorbed more than 90% of the extra heat caused by global warming, Francis continues, with the polar oceans 'playing the key role in this uptake.' The atmosphere would have warmed by a cataclysmic 36°C if none of the heat trapped by greenhouse gases had been absorbed by the world's oceans, she states.

Furthermore, it is generally accepted that climate change is happening fastest and in its most severe form at the poles, meaning these regions are effectively the 'canary in the coal mine' – an early warning signal of impending changes to the rest of the globe. No wonder that BAS's scientific research programme is dubbed 'Polar Science for Planet Earth.'

In fact, it was the BAS that first discovered the hole in the ozone layer, back in 1985. This in turn led to the Montreal Convention banning production of substances that deplete the ozone layer – such as CFCs and chemicals in fridges. These harmful substances 'reacted with

BAS director Jane Francis

ice particles in the air' leading to their detection, explains Francis, but after legislation was brought in the hole is now gradually closing, 'one of the most successful scientific impacts on policy.'

'I can't emphasis enough how important the oceans are as a global conveyor,' begins Francis in her conversation with this writer. 'You can't look at them except as a global body, which has direct impact on climate and vice-versa.

'And the important thing about oceans at present, especially the Southern Ocean, is that they're absorbing CO_2 and heat. Polar oceans in particular are really important because polar regions are the ones on Earth most sensitive to climate change, and where in the past, millions of years ago, and today you see the impact first.

In the Arctic region in the north, 'sea ice is melting rapidly,' reports Francis, while in the south 'the warming oceans are getting

up under the ice shelves at the edge of Antarctica and we believe are threatening the existence of the shelves themselves, which are the buttresses that keep Antarctic ice sheets in place.

'What's really critical is that the ice of Antarctica holds 70% of the world's fresh water, so if all that melts it's going to raise global sea levels by many tens of metres, meaning that what happens in the polar regions has a major global impact.'

If all this sounds alarmist, it is only in keeping with the attitude of the eponymous naturalist after whom the new research vessel is named. A popular vote on the vessel's name during the early stages of her construction originally plumped for one wag's suggestion of Boaty McBoatface; the name has been retained for an Autonomous Underwater Vehicle (AUV) developed by the National Oceanography Centre (NOC). Sir David Attenborough himself – now arguably the world's highest profile environmental campaigner – attended the ship launch where he called the decision to name the vessel after him simply 'the greatest possible honour.'

Francis stresses that the new ship is fully compliant with the IMO's Polar Code,

Polar star in the making

The Birkenhead site of shipbuilder Cammell Laird, located on the River Mersey opposite Liverpool, hit the headlines in a big way in 2015 as it beat off international competition to win the order for one of the world's most advanced Polar research vessels.

The 128mtr RRS Sir David Attenborough, a Rolls-Royce UT 851 PRV design, began its life in the shipyard's vast construction hall and was launched in July 2018. It is packed full of Kongsberg Maritime equipment and systems, developed and brought to market by Rolls-Royce Commercial Marine prior to its acquisition by the Norwegian company.

Four diesel-electric Bergen engines – two nine-cylinder and two six-cylinder units – will provide the power to turn two 4.5mtr diameter controllable pitch propellers and drive the vessel through ice up to 1mtr thick. Machinery has been specially designed and installed to guarantee minimal underwater radiated noise, necessary for marine scientific study.

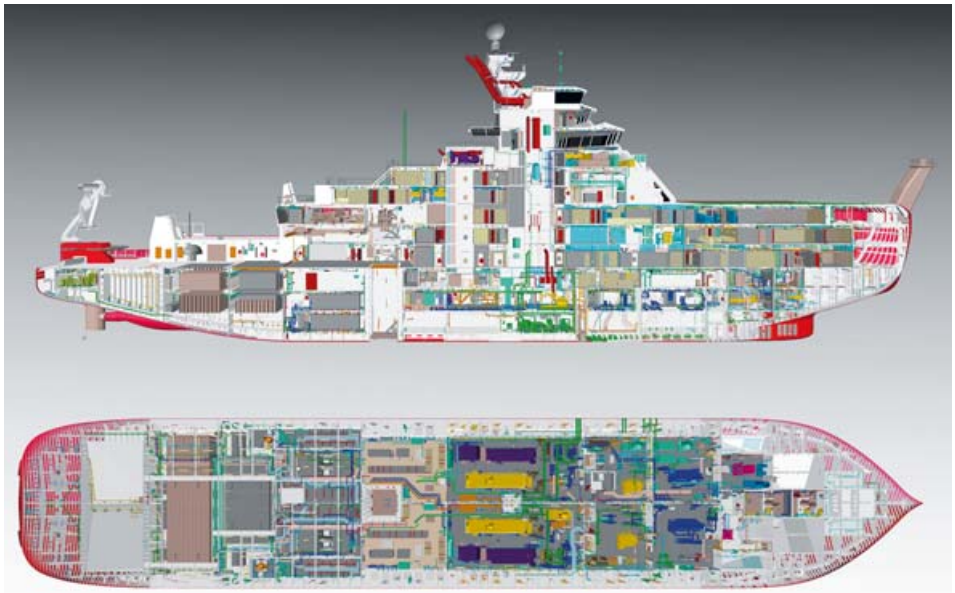
The specially reinforced hull is protected by an impermeable, glass-flake strengthened hull coating, Ecospeed, and the vessel will be able to accommodate 90 people on research voyages of up to 19,000nm.

Einar Vegsund, a member of Kongsberg Maritime's Ship Design team, describes how the company is providing a broad range of other components and systems, besides the ship's design and control package. In addition to her oceanographic tasks and on-board sample analysis capability, the vessel is also a cargo ship, he explains, undertaking logistics and large cargo shipments to Antarctica, and able to accommodate the operation of two helicopters.

Kongsberg has supplied many special-purpose winches with multiple types of scientific cable. Arranged in the high-tech winch room, they allow the deployment of vital scientific equipment, either over the ship's starboard side, aft, or through the 'moon pool' wet porch. They include instruments for subsea acoustic surveys, using up to 12km of special wire, and for collecting seabed samples at water depths down 9km.

'A key part of the supply package is the vessel's automation and control systems, including the award-winning Unified Bridge,' says Vegsund. 'This will provide the crew with the most advanced and innovative working conditions and operator tools on a vessel's bridge today.'

By Paul Bartlett

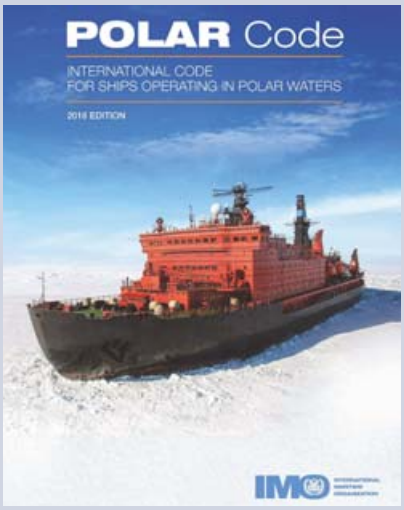


Artist's impression of RSS *Sir David Attenborough* during ice breaking operations, plus vessel section and plan (above)

introduced to safeguard both personnel on ships visiting the region and the fragile environment itself (see box). Her icebreaking capability and full suite of scientific instruments and equipment means she 'will be able to go into more remote regions than before and understand what's happening in the oceans with the warming climate – in terms of ocean currents, ice cover, marine life – and generally how oceans are reacting in the new warmer world.'

Honoured by Queen Elizabeth for her hands-on research as a geologist in the polar regions, and former head of the Faculty of Environment Sciences at University of Leeds, where she is now Chancellor, Francis ends the interview with a direct message to the shipping community.

'If I am allowed one wish,' she says, 'it would be that, ideally, every ship that sails the oceans would contain equipment that records various data, which would help our understanding of how the oceans are changing in our new and warmer world.' ●



The IMO's mandatory Polar Code, for ships operating in Arctic and Antarctic waters, entered into force on 1 January 2017, adding an extra layer of safety and environmental requirements to those already contained in existing IMO global conventions such as SOLAS and MARPOL.

Trends and forecasts indicate that polar shipping will grow and diversify over the coming years, both in terms of commercial and tourist voyages, IMO explains, with this region's specific challenges needing to be met without compromising either safety of life at sea or the sustainability of the polar environments.

The Code therefore sets out mandatory standards covering the full range of design, construction, equipment, operational, training and environmental protection matters that apply to ships operating in the inhospitable waters surrounding the two poles.

Protective thermal clothing, ice removal equipment, enclosed lifeboats and the ability to ensure visibility in ice, freezing rain and snow conditions are among the Code's mandatory safety requirements.

The regulations extend to the materials used to build ships intended for polar operation, and all tankers under the Code will have to have double hulls. From an environmental perspective, the code prohibits or strictly limits discharges of oil, chemicals, sewage, garbage, food wastes and many other substances.