THE JULES VERNE TROPHY

ADVENTURE BOOK

SPINDRIFT FOR SCHOOLS

SPINDRIFT RACING
THE JULES VERNE CHALLENGE

Created by Spindrift racing, during the first attempt at the Jules Verne Trophy in 2015 the educational programme, Spindrift for Schools, aims to capture children's imagination by conveying in an innovative and playful manner, what the team's discoveries during their sporting adventures.

Come aboard with us!

Aimed at teachers of pupils between 7 and 15 years old, the following multidisciplinary Adventure Book has been designed in collaboration with teachers and educational experts and allows the children to participate in the round the world voyage of the maxi-trimaran *Spindrift 2*.

Each themed section enables teachers to bring to life the ideas within the programme in their classes, including history, geography, sciences and education on sustainable development as well as use material from life onboard for a crew the 12 sailors sailing for six weeks on the high seas!

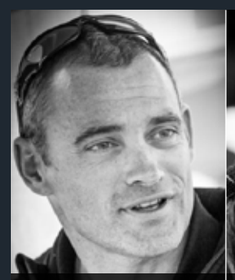
Over the last four years the programme Spindrift for Schools has enabled more than 12,000 pupils from 15 different countries to follow the progress of the sailors at sea and, at the same time as explore the multidisciplinary theme alongside the French and Swiss school curriculum.

Motivated by the ambition of the team to bring home the record on this new attempt during winter 2019-2020, the kit has been updated and improved with new data, stories and illustrations.

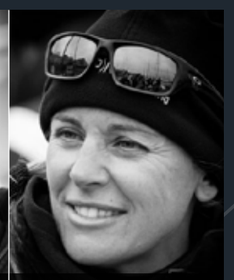
Dona Bertarelli, to date one of the fastest female round the world sailors, shares her adventure with us thanks to educational texts and the reports based on her experience of the 2015 Jules Verne Trophy.

The team invites teachers to follow the new attempt at the round the world record by the maxi-trimaran and its crew.

OUR FOUNDERS



YANN GUICHARD



DONA BERTARELLI

"Since the birth of the adventure that is Spindrift racing, sharing our passion for sailing as well as the work of our crew with younger generations is close to our hearts. Throughout this educational Adventure Book, we explore how the trimaran *Spindrift 2* allows us to live and observe the oceans around the globe. We would like to instill in children the desire to realise their dreams with the knowledge that with desire, hard work and mutual undrstanding, they have the opportunity to achieve their ambitions."

Dona Bertarelli and Yann Guichard

SUMMARY

The Jules Verne Trophy

The extraordinary voyage of *Spindrift 2*

The Spindrift racing crew

Life onboard *Spindrift 2*

Glossary

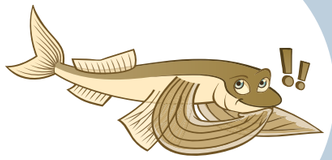
THE STORY OF A MYTHICAL CHALLENGE

This challenge was originally created by Jules Verne in 1872 for his character Phileas Fogg who undertakook to travel Around the World in 80 days. In 1985 the sailor Yves Le Cornec had the idea to launch a challenge inspired by this novel.

In 1985, the goal of sailing around the world in 80 days seemed feasible. In effect, at an average of 13 knots, the 40,000 km of the earth's circumference at the equator could be achieved in the same time as that imagined by Jules Verne in his novel.

In 1990 a committee was tasked with outlining the ethics and rules of the competition. It was composed of well-known yachtsmen such as Peter Blake, Florence Arthaud Jean-Francois Coste, Yvon Fauconnier, Gabriel Guilly, Robin Knox-Johnston, Titouan Lamazou, Yves le Cornec, Bruno Peyron, Olivier de Kersauson and Didier Ragot.

On the 13th August 1990 it was agreed that the start and finish line should be between the lighthouse at Créac'h (Ushant) and the Lizard (Cornwall in England) whilst leaving the three Capes to port (Good Hope, Leeuwin and Horn).



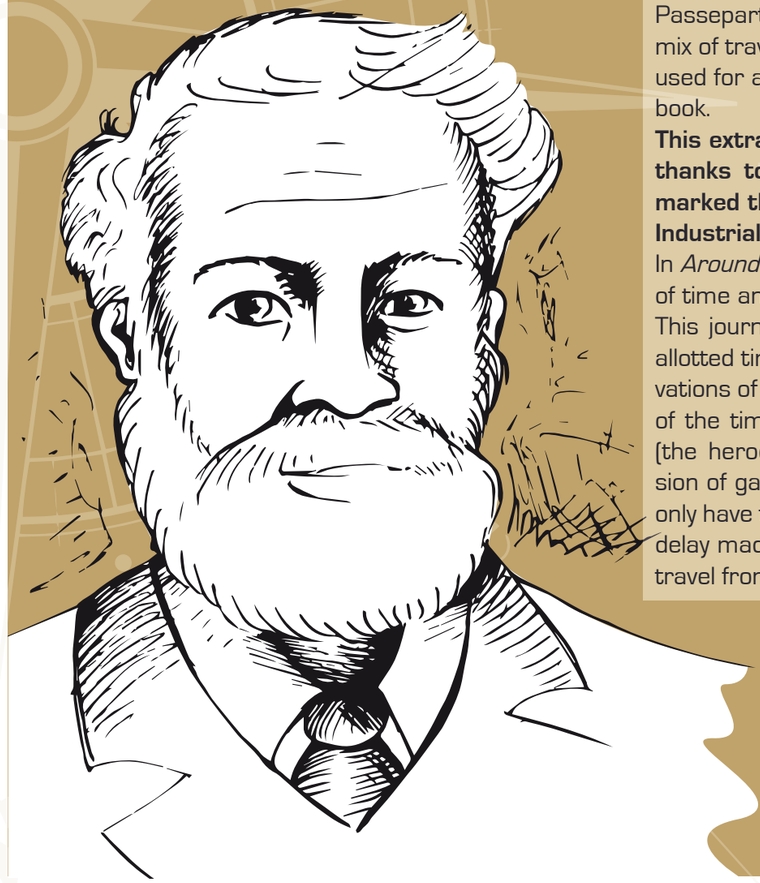
REMEMBER!

The Jules Verne Trophy is a challenge which is awarded to the circumnavigation of the globe achieved in the shortest possible time by a crew, without stops and without assistance over a distance of 40,000 km (21,600 nautical miles). The Trophy is awarded to the challenger who beats the record. The winner retains the trophy until the time is beaten. In that case, the Trophy is passed on to the new record holder.

A PORTRAIT OF JULES VERNE

Jules Verne was born on the 8th February 1828 in Nantes. At 11 years old, he ran away and signed on as a cabin boy on a boat bound for the West. His father caught up with him at the first port of call and Jules Verne went back to his studies and successfully passed his exams. He then went to Paris to study law and wrote plays for the theatre.
In 1863 his first novel, *Five weeks in a balloon*, was published by Pierre-Jules Hetzel, and it was a great success. His publisher got to know him well and helped to develop his writing. **Whether going to the moon, living at the bottom of the sea or flying in the sky, Jules Verne imagined it and the twentieth century made it possible. A visionary, a populariser of the sciences, a romantic and a humanist, he is the first author of futuristic science fiction.**

During his life, Jules Verne wrote more than 80 books that told of fantastic voyages. The sea fascinated him and at 40 he bought his first boat: the *Saint-Michel.* During the war of 1870 he armed his boat and became a coast guard, and later replaced it with the Saint-Michel II.



AROUND THE WORLD IN 80 DAYS

Around the World in 80 days is an adventure novel, which Jules Verne published in 1872. The novel recounts the bet made by Phileas Fogg, an English gentleman, to make a voyage around the world in 80 days. He was accompanied by Jean Passepartout, his French servant. The novel is a mix of travelogue and scientific data, like the one used for action packed tension at the end of the book.
This extraordinary journey was made possible thanks to the revolution in transport which marked the 19th century and the start of the Industrial Revolution.
In *Around the World in 80 days,* the parameters of time and space are fundamental to the story. This journey is also about time. First of all, the allotted time is known (80 days) and then observations of the countries crossed are all evidence of the time lags in geo-historical developments (the heroes thus sometimes have the impression of gaining time) and finally the victory could only have taken place thanks to this famous time delay made possible by the fact that the heroes travel from west to east.

THE JULES VERNE TROPHY: THE RULES OF THE RACE

The Jules Verne Trophy is a race around the world under sail, with a crew, without stops or seeking assistance, which involves great commitment. The rules give a framework to the race and an understanding of its ethics and spirit, of ethics guarantees this freedom.

RULES

The Jules Verne Trophy is unique and is awarded to the challenger who improves on the record time for circumnavigation of the globe under sail. The winner will be the holder of the Trophy until their record is broken. In this case the Trophy is awarded to the new holder.

THE COURSE

- Crossing the start line, defined as an imaginary line between the Créac'h lighthouse at Ushant and the lighthouse on the tip of The Lizard.
- Sail around the world leaving to port the capes of Good Hope, Leeuwin and Horn.
- Recrossing the line as defined above, but in the opposite direction.

PARTICIPANTS

Only the forces of wind and the crew will be used to propel the boats. The Trophy is open to any type of boat, with no limits.

CREW

There can be any number of crew members.

ASSISTANCE

Absolutely no external help will be allowed (apart from plotting the route).

THE TROPHY

The American artist Tom Shannon was commissioned to make the trophy by the Visual Arts Delegation under the auspices of Ministry of Culture and Communication. The National Maritime Museum in Paris hosts and maintains the Trophy. This Trophy represents a simple hull floating on a magnetic field and held by a cable, anchored like a vessel.

All dimensions of this Trophy have rigorous symbolic meaning. The proportions of the hull correspond to the diameter of the Earth, the radius of each end is proportional to that of the moon and the radius of the curvature of the hull is proportional to that of the sun. The Earth, the Moon and the Sun are, symbolically, the only companions along the route of the competitors for the Jules Verne Trophy.

A CHALLENGE: AGAINST THE CLOCK AND PERSONAL

Originally, round the world voyages under sail widened the limitations of the known world. With the great discoveries, economic opportunities opened up through new commercial and strategic routes.

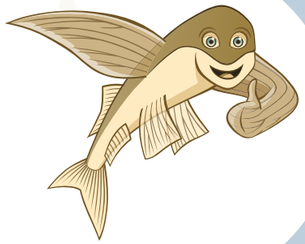
Today, if there are no more lands to conquer, it is the records that we get to chase around the world.

The sponsors and organisers of offshore races find that these sporting events have economic and sporting benefits and coastal ports seek to welcome the stop-overs of these round the world voyages, to develop their tourist trade.

These races involve a personal challenge, which from a medical point of view enables the study of the psychological and physiological behaviour of the sailors under extreme conditions. There is also the importance of technical performance with a focus on new materials and new shapes (hydrodynamic and aerodynamic). The advanced technology of offshore racing then filters down to recreational sailor.

The fitness of the crew depends on their capacity to recover well and to eat well: for some years, doctors and nutritionists have developed new balanced freeze dried products. The multi-phase sleep patterns* of each participant is studied and these studies have paved the way for important medical and technical advances for the general public.

** A multi-phase sleep pattern is a type of rest in which the periods asleep during a 24-hour period are split into several periods instead of being grouped into one "night".*



REMEMBER! PAST RECORD-HOLDERS

1993 ..... Bruno Peyron - *Commodore Explorer* - Catamaran - 79 days 6 hours 15 mins 56 secs
1994 .... Peter Blake - *Enza* - Catamaran - 74 days 22 hours 17 mins 22 secs
1997 .. Olivier de Kersauson - *Sport Elec* - Trimaran - 71 days 14 hours 22 mins 8 secs
2002.. Bruno Peyron - *Orange* - Catamaran - 64 days 8 hours 37 mins 24 secs
2004 . Olivier de Kersauson - *Geronimo* - Trimaran - 63 days 13 hours 39 mins 46 secs
2005.. Bruno Peyron - *Orange 2* - Catamaran - 50 days 16 hours 20 mins 4 secs
2010 . Franck Cammas - *Groupama 3* - Trimaran - 48 days 7 hours 44 mins 52 secs
2012 ..... Loïk Peyron - *Banque Populaire V* - Trimaran - 45 days 13 hours 42 mins 53 secs
2017 ..... Francis Joyon - *IDEC* - Trimaran - 40 days 23 hours 30 mins 30 secs

THE OCEANS CROSSED

To beat the around the world speed record under sail, *Spindrift 2* has to cross three oceans: Atlantic, Indian and Pacific. The globe holds five oceans, each with its own particular features (surface area, climate and marine life).

The first ocean crossed by *Spindrift 2* is the Atlantic. With 82 million square kilometres, this ocean covers almost 25% of the globe. It extends from the east coast of the American continent to the west coasts of Europe and Africa. The Atlantic Ocean is subject to very variable climates. The Gulf Stream is a warm oceanic current that flows from west to east in the North Atlantic. It warms the coasts and renders the climate moderate on the seaboard.
At a latitude of 34°21'25" South and 18°28'26" East, the Cape of Good Hope represents the symbolic frontier between the Atlantic and Indian oceans.

Then *Spindrift 2* crosses the smallest of the Earth's oceans, the Indian Ocean. Often conditions become very rough and there is always the risk of drifting icebergs. The Indian Ocean covers an area of 75 million square kilometres. Its northern boundary is India, Pakistan and Iran; to the east are Burma, Thailand, Malaysia, Indonesia and Australia; to the south is the Antarctic Ocean and, in the west, Africa and the Arabian Peninsula.

During the Northern winter, the northern part of the Indian Ocean knows only moderate winds but south of the thermal equator tropical cyclones develop, which circulate on the oceanic air and sometimes reach the coasts of the continents. These are warm waters that shelter a very rich flora and fauna such as mangroves and coral reefs. There are also numerous inhabited islands in the Indian Ocean, including Mayotte, Reunion.

With a surface area of 180 million square kilometres, finally *Spindrift 2* takes on the biggest ocean in the world, the Pacific Ocean. This ocean holds the record not only for the number of islands but also the greatest density of volcanoes.
Approaching the tropics, the sailors pass from a cold climate, through a temperate one to a very hot, tropical climate. Near the Equator is found the zone where the tropics come together with the trade winds, whose position changes with the season, and which play a huge role in the rainfall of the tropics and navigation at sea. This is known as the Subtropical Convergence Zone or the Doldrums.

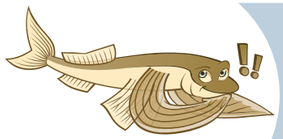
PACIFIC EXPLORERS

Balboa

Vasco Nuñez de Balboa, the first European to reach the Southern Ocean on 25th September 1513.

Magellan

Fernand de Magellan, undertook the first crossing of the Pacific Ocean from east to west in 1520 – 1521.



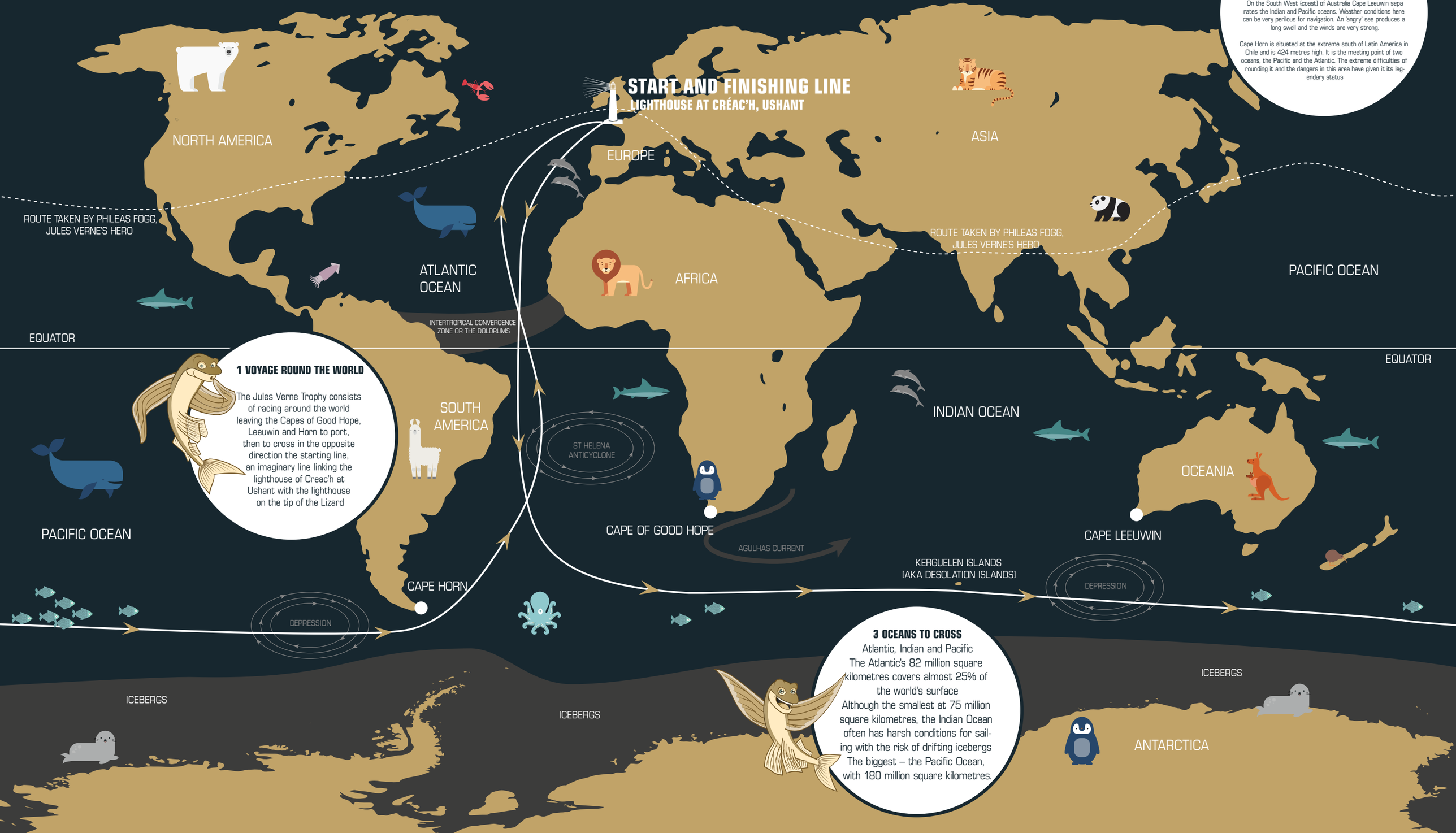
REMEMBER!

There are five oceans in the world :
the Pacific, the Atlantic, the Arctic, the Antarctic and the Indian. Each ocean is, in turn, divided into seas, gulfs, bays, straits...

ROUTE OF THE JULES VERNE TROPHY

DISTANCE TO SAIL
40,000 KM (21,600 MILES)

RECORD TO BEAT
40 DAYS **23** HOURS **30** MINUTES **30** SECONDS



3 CAPES TO SAIL PAST

The Cape of Good Hope is an imposing rock on the Atlantic coast of South Africa. It was named by the sailors who discovered it in 1488 during the expedition of Bartholomew Diaz.

On the South West (coast) of Australia Cape Leeuwin separates the Indian and Pacific oceans. Weather conditions here can be very perilous for navigation. An 'angry' sea produces a long swell and the winds are very strong.

Cape Horn is situated at the extreme south of Latin America in Chile and is 424 metres high. It is the meeting point of two oceans, the Pacific and the Atlantic. The extreme difficulties of rounding it and the dangers in this area have given it its legendary status

1 VOYAGE ROUND THE WORLD

The Jules Verne Trophy consists of racing around the world leaving the Capes of Good Hope, Leeuwin and Horn to port, then to cross in the opposite direction the starting line, an imaginary line linking the lighthouse of Creac'h at Ushant with the lighthouse on the tip of the Lizard

3 OCEANS TO CROSS

Atlantic, Indian and Pacific
The Atlantic's 82 million square kilometres covers almost 25% of the world's surface
Although the smallest at 75 million square kilometres, the Indian Ocean often has harsh conditions for sailing with the risk of drifting icebergs
The biggest – the Pacific Ocean, with 180 million square kilometres.

SAILING ROUND THE CAPES

The race for the Jules Verne Trophy consists of a voyage around the world, leaving to port the Cape of Good Hope, Cape Leeuwin and Cape Horn and then crossing the starting line in the opposite direction, the imaginary line between the Créac'h lighthouse on the island of Ushant and the lighthouse on the tip of the Lizard (an orthodromic[1] distance of 40,300 kilometres). The passage around each of these capes is a landmark during the race and sometimes presents a particular danger.

THE CAPE OF GOOD HOPE

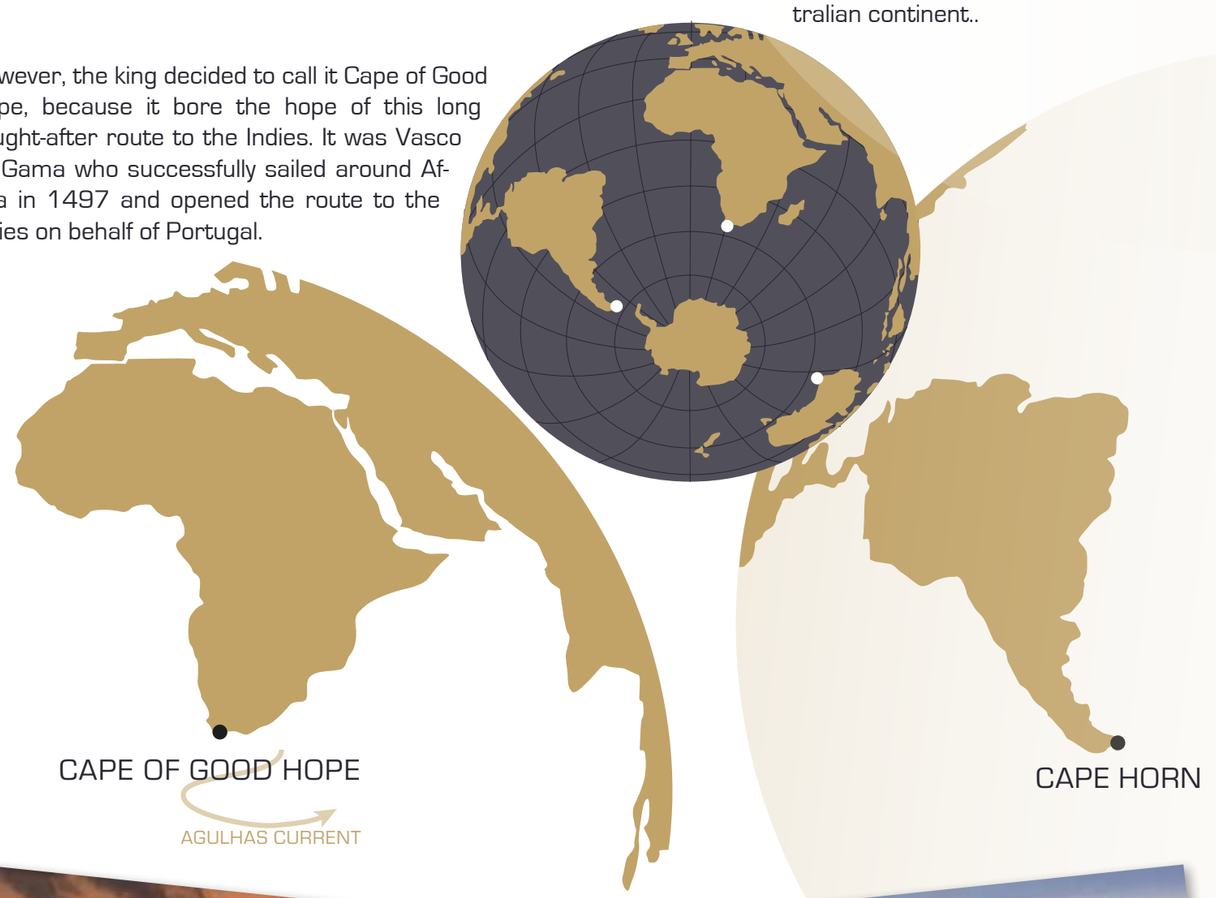
The Cape of Good Hope is a large rocky promontory on the Atlantic coast of South Africa. It is located at the junction of two very different maritime currents, a cold current, the 'Benguela' to the west and a warm current, the 'Agulhas' current, to the east. However, the Cape is not the most southern point of Africa, that is Cape Agulhas to the south east.

In 1487 Bartholomew Dias was ordered by the King of Portugal, Jean II, to map the African coasts already known to the Portuguese and to try to find a trade route to Asia, particularly to spice-rich India, as the overland route to these precious commodities, worth a fortune in the West, was the monopoly of the Arabs.

To own a new sea-going route to the Indies was thus a source of riches for the kingdom of Portugal. In the summer of 1487, Bartholomew Dias ordered his two caravels [small Portuguese sailing ships] to sail from the coast of Namibia and find winds to carry them westwards. However, a very violent storm forced Dias to turn around.

He rounded a cape which he named "Stormy Cape" referring to the bad weather conditions they met in that zone.

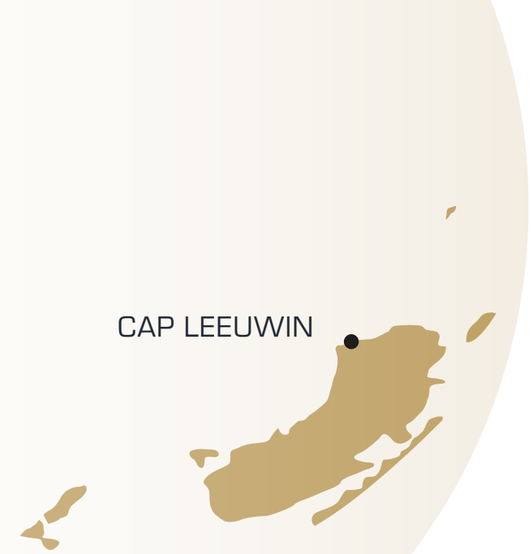
However, the king decided to call it Cape of Good Hope, because it bore the hope of this long sought-after route to the Indies. It was Vasco de Gama who successfully sailed around Africa in 1497 and opened the route to the Indies on behalf of Portugal.



[1] Orthodromic distance – the shortest distance between two points on a sphere, ie the smallest of the two arcs of a great circle which passes these two points

CAPE LEEUWIN

Situated in the south-west of the Australian continent, Cape Leeuwin is a part of the route for all sailors who venture round the world. It separates the Indian ocean from the Pacific Ocean. The conditions for navigation can be very perilous, characterised by rough seas with big swells and strong winds. Matthew Flinders named it Leeuwin ('Lioness' in Dutch) in December 1801 after a Dutch ship, which discovered and charted part of the south-west coast of Australia in March 1622. The Leeuwin was the seventh European vessel to have sight of the Australian continent..



CAPE HORN

Although it is feared by the most experienced sailors, Cape Horn remains nonetheless the most fascinating passage. It is located at the far south of Latin America, in Chile and is 424 metres high. It is the meeting point between two oceans, the Pacific and the Atlantic.

Cape Horn marks the northern frontier of Drake's passage. It was for many years a crucial passage for commercial routes between Europe and Asia. These routes were taken by sailing ships to transport merchandise all around the globe, this in spite of the numerous dangers (heavy and frequent storms with huge seas and the possible presence of icebergs...).

These dangers and the extreme difficulty of the passage have given Cape Horn its legendary character. Today, thanks to the Panama Canal, ships are no longer obliged to take the dangerous route round Cape Horn.

THE ANIMALS ENCOUNTERED

During the attempt at a round the world record under sail, most of the sailors are completely absorbed in the race. However, some have had surprises, even unexpected companions on their voyage.

When Olivier de Kersauson and his crew tried to win the Jules Verne Trophy in January 2003, they encountered a giant squid off Madeira. The animal had slowed down their trimaran Geronimo, and it had tentacles as big as human arms.
Giant squid *Architeuthid* (Latin name) are present throughout most of the world. They live at depths between 300 and 1,000 metres, even though sometimes they come up to the surface. It was only in July 2012 that the species was first properly observed and filmed living in its natural habitat off Japan.
During Spindrift racing's last attempt around the world, the sailors weren't isolated in the middle of the oceans. At each stage of their voyage they had visits from several marine animals, which accompanied them: from majestic albatrosses to impressive flying fish and playful dolphins as well as imposing whales, the oceans yielded their treasures!

THE ALBATROSS, KING OF THE OCEANS

It is the largest living bird. A wing span of between 2.5 – 3.5 metres allows them to fly and glide in the sky for hours on end without even having to beat their wings. Even in the middle of the worst storms at sea the albatross appears not to move.

The real conqueror of the raging seas of the South, its body is in harmony with the wind and, with outstretched wings, it is able to change direction when the wind blows, sometimes swooping over the surface of the sea and sometimes up into the sky. It is this dynamic gliding that enables the albatross to glide on the wind for thousands of miles, rarely beating its wings.
On average, a 50-year old albatross will have flown 3.7 million miles during its lifetime.
The albatross only goes ashore to reproduce, and spends two years courting its soul-mate, which becomes the one love of its life. Their single offspring, needs both its parents to provide enough nourishment for it, and that's a real challenge!

They both must fly more than 10,000 miles to gather enough fish and squid to give their growing little one food. By the time the young albatross leaves its nest at 9 months old, it flies off alone at sea where it will survive for five years before returning to the exact spot where it was born in order to find, in turn, its soul mate and thus continue the cycle of life..

We have been sailing in the Southern Ocean for a week without seeing an albatross.

During the last attempt at the record for the Jules Verne Trophy Xavier (Revil) and Thierry (Duprey du Vorsent) each saw an albatross follow their yacht for hours on end.
Tom (Rouxel) explained that these birds play around with speed and prefer to have fun with multi-hulls rather than following behind slower vessels. My adventure on the Southern Ocean has only just begun and I keep hoping to see the 'King of the Oceans' in action.

And then, when I was just about to post this article, a young albatross did us the honour of visiting us. First of all, it was timid, it gained in confidence and came very close to the boat, flying beside us, as though we were its training partner. Time stopped for all the crew of Spindrift 2 who watched this spectacle, less than two metres from the boat. What a privilege! So beautiful, so rare...

Extract from the ship's log of DB during the 2015-2016 voyage.

Dona

OBSTACLES TO OVERCOME!

Racing yachts today are at the forefront of technology, with ever-improving performance. They can, however, all suffer from major damage. Natural phenomena such as weather, icebergs or human factors can also represent dangers, even for a seasoned crew

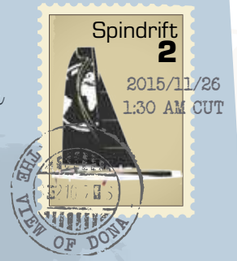
THE DOLDRUMS

What's known as the Doldrums is a meteorological zone where the North East winds of the Northern hemisphere and the South East winds of the Southern hemisphere converge off Sierra Leone (Africa) to produce a cone-shaped transition zone pointing towards South America rather like a belt around the globe at the level of the equator.

The winds are light and stormy squalls are numerous because of the high rate of evaporation just above the equator. The Doldrums can generally be found between the latitude 3° and 7° North and are more or less constantly active with weak winds alternating with violent gusts and squalls, a widespread area of calm and a slow transition between the two sets of trade winds in the Northern and Southern hemispheres.

Thanks to a great amount of weather data and satellite images analysed by Jean-Yves Bernot, *Spindrift 2*'s navigator ashore, Erwan the onboard navigator and Yann Guichard can find the best point to cross this zone and thread their way southwards.

Dona Bertarelli



Wretched Doldrums!

These last few hours onboard are only for him ...Erwan, our navigator, tells us that during one of his trips for the Volvo Ocean Race at the approach to the Doldrums he was sailing at 30 knots speed when all of a sudden, nothing. Nothing, not a breath of air!

So here we are, on Spindrift 2 watching out for every cloud, every breath of a breeze, each colour change on the sea or frequency of the waves.

For the moment, it's not too bad. We are more or less managing to advance and we haven't yet had a stop. The hardest thing has been the sail changes, repetitively reefing in [the sails] when the wind changes from 5 to 25 knots. The key word for the watch leaders: don't let yourselves be surprised and anticipate well ahead.

Two petrels came and said hello this morning. These birds, white below and black backed, live at sea. They only return ashore to lay a single egg. They have followed us for a short while and then they disappeared over the horizon into a grey sky full of rain. So, when are we going to get a drenching?

Dona

THE ROARING FORTIES AND THE FURIOUS FIFTIES

Entry into the Southern Oceans does not pass unnoticed. Depression after depression, the strongest winds upon the earth are unleashed and an unbelievable force on the water causes waves up to 15 metres in height! The Forties and Fifties are feared by sailors who find themselves very far from land in this region of the globe.

THE UFOs

Often impossible to detect on the radar, other uncontrollable elements are added to the weather risks. Here we are talking about UFOs (Unidentified Floating Objects) such as, for example, **whales, containers or wooden debris**.

Maritime experts estimate that of the 200 million containers transported across the oceans of the world, about 10,000 fall into the sea each year. Each of these "boxes" can measure up to 40 feet (about 12 metres) and represent an ecological risk.

When containers falling overboard are reported, the forecasters and CEDRE (Centre for research on accidental water pollution [a French organization]) will establish the area at risk taking into consideration drifting caused by wind and currents.

The [French] Navy and Customs will carry out patrols to try and find them. For its part CROSS (The Regional Operational and Rescue Centre) will warn vessels crossing this sector.

However, this method remains random in as much as losses of containers are not always notified by the ship owners. The only method for avoiding these UFOs is to keep a permanent watch on the surface of the sea.

Luckily, the further South you go, the rarer these containers and large pieces of rubbish become.

ICEBERGS AND SATELLITE IMAGERY

An iceberg is a piece of an ice floe that has broken off. There can be many reasons for this, but scientists are in agreement when they say that global warming is the main cause of melting glaciers.

NASA (National Aeronautics and Space Administration) and the University of California explain, in studies which they published in May 2014 in the journal 'Science', that the Western part of Antarctica is melting rapidly and that its decline is irreversible.

An iceberg is 90% fresh water. The upper layers can be snow which has never melted but its centre is made of very hard and sharp ice which could be up to 150,000 years old. Only one third of its surface is visible whilst the rest is submerged under the water. When an iceberg breaks off, it takes with it many fragments of ice, some up to several tonnes, which are known as 'growlers'.

In February 2010 the National Ice Center, which follows the development of icebergs in Antarctica, detected 37 giant icebergs. **The biggest ever had broken off the Ross Ice Shelf in 2000 and initially measured 11,000 square kilometres.**

Over the years icebergs can drift before melting. They can circle around Antarctica several times in ever-increasing circles.

When we started the Jules Verne Trophy challenge in 2015, we knew that our route would lead us to navigate far South on the globe to the level of the Furious Fifties where there are drifting icebergs and growler ice.

So, when we passed through the Indian ocean, we came across an iceberg of 2km surface area at the 47th parallel. Others, smaller in size, 100m x 400 m were to be found at the 51st parallel.

Several months before our departure for this round the world voyage, we added the services of a specialist company which detects icebergs, CLS - world experts in gathering satellite information. So since the Cape of Good Hope and our entry into the Southern oceans, CLS has notified us of the presence of 34 icebergs of various sizes.

Thanks to this precise data we have been able to choose our route, not always to the benefit of performance but for that of security.

Dona

SURVEILLANCE OF ICEBERGS

From the late 70's the ARGOS system – which celebrates its 40th birthday in 2019 – has enabled individual adventurers or fleets of yachts to be followed during races.

Today CLS takes daily data from three categories of satellites: positioning satellites, which allow movements (of animals, vessels, buoys etc.) to be tracked; satellites watching earth for sea levels, swell, winds, temperature, currents, etc. and finally high resolution imaging satellites for detecting pollution, ships and also icebergs.

For the observation of icebergs, CLS uses high resolution radar imagery. The radar technology enables the surface of the sea to be watched, by day and by night, whatever the cloud cover.

The largest radar satellite images (500m x 500m) have a spatial resolution of 100metres which allows the detection of icebergs of this size.
They can appear immense but they are only like postage stamps in the immensity of the Southern Ocean.

This is why other sources of information allow us to improve our knowledge of the presence of icebergs:

- altimeters, developed for measuring the average sea levels of our oceans, can pick up the presence of an iceberg when one of them passes through its beam
- the temperature of the water is another excellent indication of the presence of ice.
- Radar imaging satellites for scanning the surface in search of icebergs.

Source : Vincent Kerbaol, Director of Radar Programmes and director of the CLS site at Brest

THE INFLUENCE OF OCEANS ON CLIMATE

An important source of food and raw materials, oceans are also the basis for thermal exchanges, which regulate the world's climate.

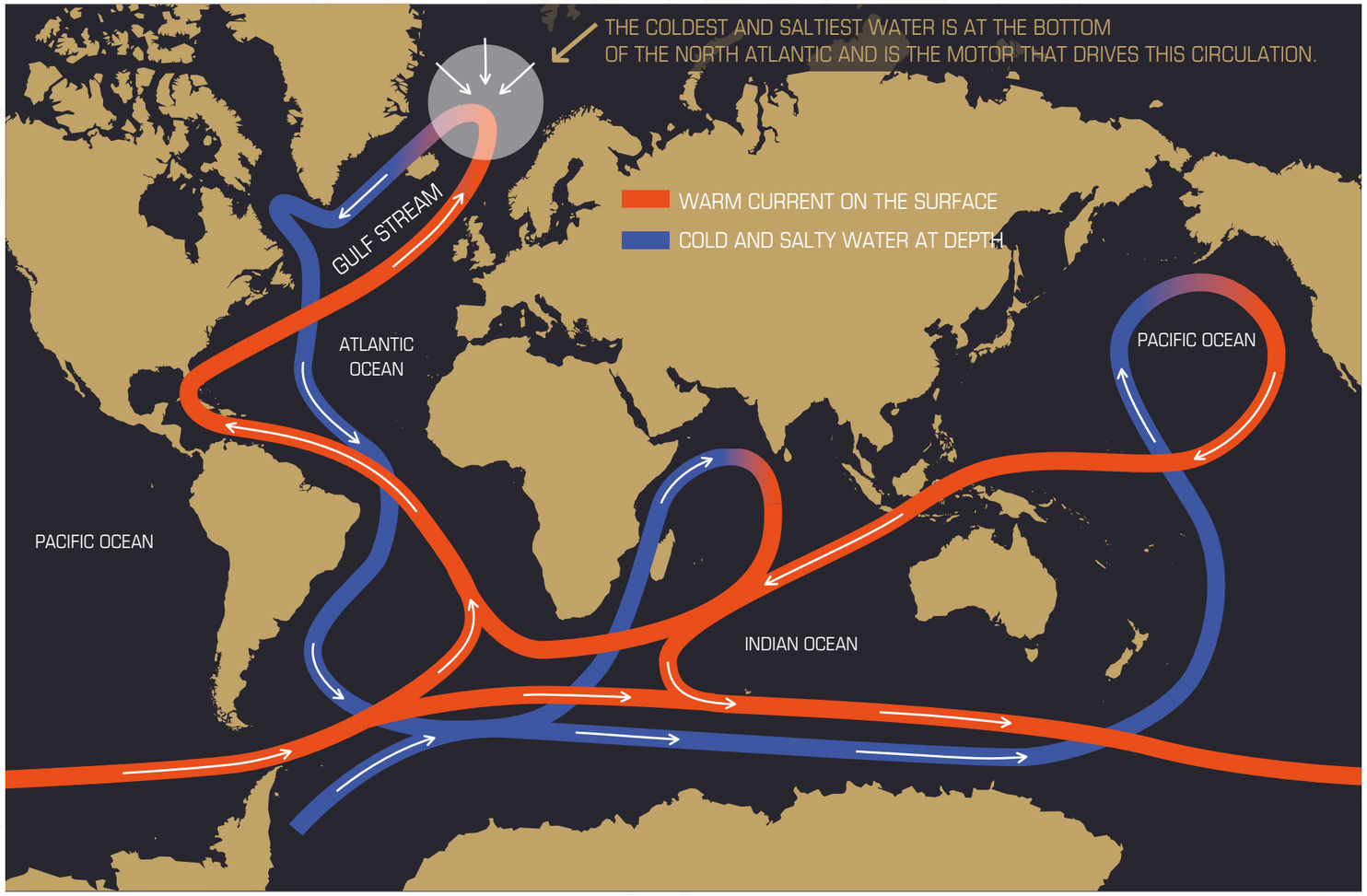
The ocean is a reservoir of heat for the planet. 30% of energy stored is returned to the atmosphere by evaporation in the form of 'latent heat'. When the water changes state and the water vapour condenses, the 'latent heat of evaporation' forms clouds. In tropical regions, the oceans hold a huge amount of heat. Currents transport it to other regions in the world where they moderate [the temperature]. Oceans have an essential role in the regulation of the air temperature around the globe.

OCEANIC CURRENTS

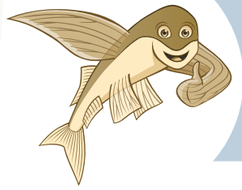
They are caused by the sun's rays which heat the planet differently between the equator and the poles.
The Gulf Stream is a warm current born in the Tropics but there are other currents, coming from the polar regions, which are cold. The masses of air turn like the hands of a clock in the Northern hemisphere and counter-clockwise in the Southern hemisphere

Thus the warm currents take warmth to the poles and the cold currents cool the waters of the tropics.

Deeper down, the currents are slower and they are caused by the differences in densities between the masses of water in the oceans. The coldest and saltiest waters drop to the bottom whilst warmer and fresher waters are lighter and rise to the surface. This phenomenon is known as "**Thermohaline Circulation**"



THERMOHALINE CIRCULATION



To learn more, download the Spindrift for Schools lesson: Mers et Oceans.
Only available in French at http://spindriftforschools.com

RECYCLING OF CARBON DIOXIDE

One third of the carbon dioxide emitted by human activities is absorbed by the oceans. Its role as 'moderator' in global warming of the planet has however, very serious consequences for the ocean because the carbon dioxide dissolved in them affects marine ecosystems and thus the biodiversity.

Equally, the oceans represent a great source for raw materials, such as nickel and oil. It is also a vital source of nourishment for numerous living things. Marine products represent 10 – 20% of all the animal proteins consumed in the world.

ZOOPLANKTON

It is made up of animal organisms which drift with the currents. In order to live, zooplankton needs to eat either phytoplankton or zooplankton smaller than itself. It is the first link in the food chain of marine animals.

The oceans of the planet are the origin of more than half the worldwide production of organic material, thanks to the activities of photosynthesis by marine phytoplankton.

These micro-organisms in suspension in the sea play a part in the carbon cycle in producing matter, thanks to carbon dioxide and sunlight.

If plankton constitute 98% of the biomass in the sea, it absorbs more than half the carbon dioxide and produces 50% of the oxygen.

It is easy to see how important it is to preserve the oceans in order to maintain a balanced climate on the planet.

METEOROLOGY AND WIND STRENGTH

A sailing boat moves thanks to the force of the wind in its sails (wind power). The speed at which *Spindrift 2* advances is related to the weather, and the strength and direction of the wind.

The movements of air masses result from differences in pressure and temperature between different atmospheric zones. The mass of air above us has a weight. This creates atmospheric pressure measured in hectopascals (hPa).

Warm lighter air has a tendency to rise in the atmosphere and to create an area of low pressure (a depression D or a cyclonic area) whilst cold air tends to descend towards the earth and that creates an area of high pressure (anticyclone A).

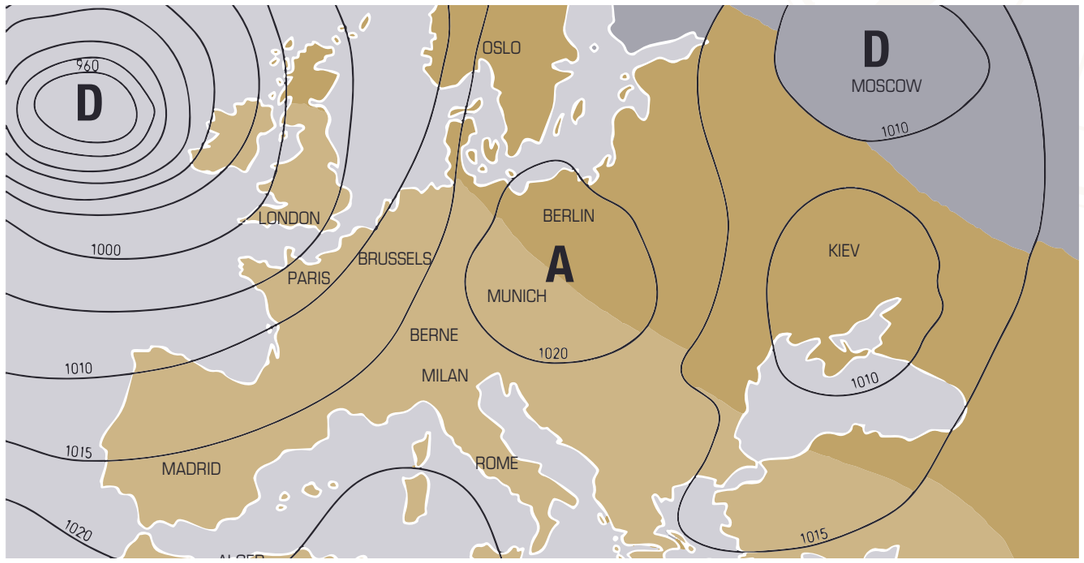
A weather map shows isobars, which are lines connecting areas of equal pressure. The closer they are together (the greater the variation in pressure) the stronger the wind. Due to the rotation of the Earth, the direction of the wind is altered (Coriolis effect).
As a result of the combined effects of this force and the vertical movement of the air mass, the wind blows at an angle of 30° to the isobars.

In the Northern hemisphere the wind turns clockwise in an anticyclone and anti-clockwise in a depression. The opposite occurs in Southern latitudes.

Wind is the fuel of sailing boats! The air moves principally because of the existence of these differences in atmospheric pressure. It is this difference of pressure between one point and another which causes displacement of the air.

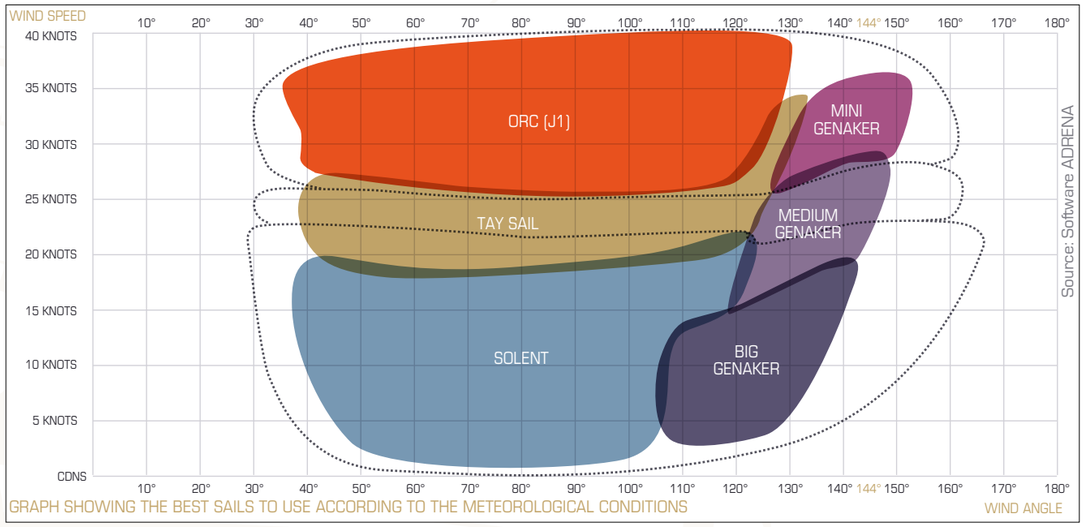
During the day, the sun heats the land more quickly than the sea. Once heated, the air rises from the surface of the land, leaving space for colder air situated over the sea. A breeze develops, directed from the sea to the land.
At night, by contrast, the sea cools more slowly than the land and so the breeze comes from the land!

MAP OF ANTICYCLONES AND DEPRESSIONS



WHICH SAIL FOR WHICH WIND?

In order to beat the round the world record under sail, Spindrift racing tested, over several months, sails adapted to the metereological conditions that they will meet. The navigator works with two software packages. Onboard, during the trip, one software package automatically registers the wind strength, the speed of the boat and the payload. Alongside this each change of sail is noted, as well as the movement of the rudders and the foils. Then all this data is analysed in order to optimise the aerodynamics and the speed of the boat. During a record attempt the navigator onboard *Spindrift 2* is therefore able to select the best sail and the one that will give optimal performance in relation to the meteorological conditions.



GRAPH SHOWING THE BEST SAILS TO USE ACCORDING TO THE METEOROLOGICAL CONDITIONS

PLOTTING A COURSE IN DAYS GONE BY

Dona Bertarelli

3,000 years ago sailors embarked in great canoes, which they themselves had made, in order to explore the Pacific.

The traditional Polynesian navigators had neither radio nor compass nor GPS to guide them, check their speed or tell the time.

These superb navigators had as their only instrument their intelligence. In effect, thanks to their instinct and their ability to understand nature, they had developed their seagoing expertise. Their 'sense of direction' served them naturally as they navigated without any instruments.

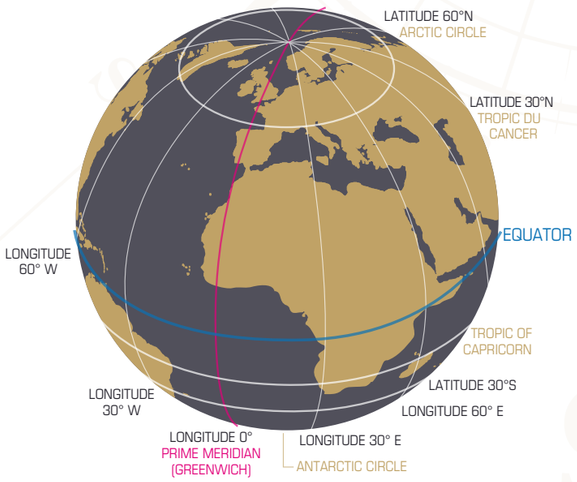
Before hoisting the sails, the navigators imagined in their heads the course they had chosen. Their brains acted as their GPS with an incredible knowledge of geolocalisation signs, such as the position of islands, the flight path of birds, different types of clouds and their formations, and the stars. They had also learnt the position of several stars, which they would encounter during their voyages.

Dona

LONGITUDE AND LATITUDE

The globe is divided into 'slices' parallel to the equator. Each slice is numbered in degrees from the equator to the North Pole (0° to 90° lat. N) and from the Equator to the South Pole (0° to 90°). That's latitude.
The globe is also divided into quarters and these lines go from the North to the South pole and are called the meridians.

In 1884 it was decided to choose as meridian '0' , the one which passed through Greenwich, London. Longitude represents the distance, in degrees, in relation to the Greenwich meridian.
Each quarter is numbered from 0° to 90° east (E) and from 0° to 90°west (W). To be more precise, each degree (°) is divided into 60 minutes (') and each minute is divided into 60 seconds "). When you know the latitude (which always comes first) and the longitude (second) of a point you can then find it quickly on a map.



NAVIGATIONAL INSTRUMENTS

Ever since the Ancient times, sailors sought to find their way at sea. They found their position in relation to the position of the sun and at night, in relation to the position of the stars. Over the centuries, sailors developed instruments which continually evolved.

THE COMPASS

The compass is an eleventh century Chinese invention. It is an instrument composed of a magnetised needle, which constantly points North inside a case on which the cardinal points are inscribed : North, South, East, West. When navigating it is used to discover the current position or even indicate the direction to follow.

MARINE CHARTS

Prior to the twelfth century they almost exclusively sailed within sight of the coast along well-frequented routes known as 'periples' [voyages] in Ancient times and 'portulans' in the Middle Ages. The establishment of these nautical charts was based on coastal navigation, which showed each port and each mooring along the way.

Most of these ancient charts were drawn on vellum. They are recognizable by the lines drawn to denote the winds that blow across the routes and are richly decorated.

The great explorers of the world enabled the development of cartography and then in the sixteenth century the invention of the printing press enabled a wider distribution of these charts, particularly through atlases. The French engineer Charles-Francois Beautemps-Beaupre and his team prepared a detailed and precise map of the coasts of France between 1816 and 1844 and it was he who was the father of modern hydrography.

THE ASTROLABE

An astrolabe is a very ancient instrument that allows one to calculate the height of a star above the horizon, which immediately determines the position of the Moon, the Sun or any other planet in relation to the stars

THE SEXTANT

Like the Astrolabe, the 'modern' sextant (1730) also measures the height of the stars but more precisely. The advantage of the sextant is that the two directions you want to measure the angle between, are observed at the same time. This renders the measurement a little more independent of the movements of the ship.

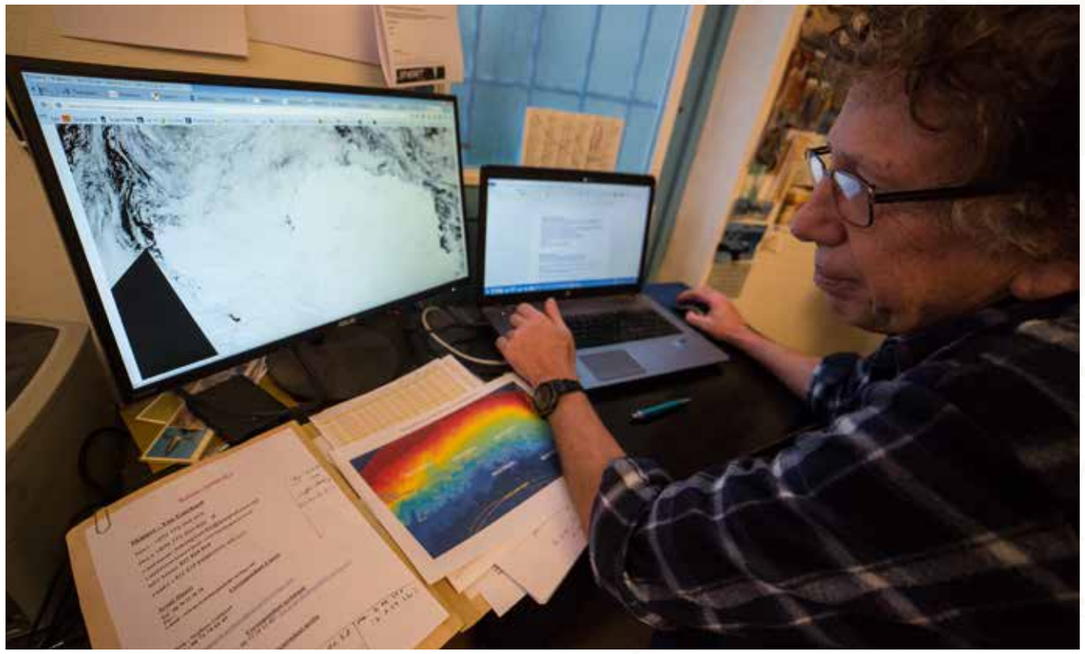
Portulan of Vesconte Maggiolo (1541)
Europe, the Mediterranean and North Africa

PLOTTING A COURSE TODAY

These days developments in research and innovation have greatly facilitated the ability of sailors to find their bearings at sea, particularly thanks to the invention of measuring instruments and electronic positional systems. At sea, the sailors on *Spindrift 2* have to be able to analyse the weather and to thus choose the best route. A router based onshore and the technical instruments onboard the boat, allow them to choose the best possible strategy and route.

SHORE BASED ROUTE FINDING

Yann Guichard has teamed up with a shore-based Router whose role is to analyse all the meteorological data in order to help him with his strategy. Considering the constraints and demands of the boat, it is impossible for Yann to spend all his time at the chart table. The work is therefore prepared ashore and options are put forward for analysis. Onboard, a crew member has a dedicated role at the chart table - the navigator. He receives and analyses the data sent by the shore-based Router.



Jean Yves Bernot - shore-based Router for Spindrift 2

THE CHART TABLE

This is the nerve centre of the boat. It is here, in front of the onboard computers, that the sailors analyse all the meteorological charts. Satellites supply internet access to the boat and it is thanks to this connection that the skipper receives the meteorological files, (INMARSAT satellite).
Also on the chart table is the GPS (Global Positioning System) a barometer giving the atmospheric pressure, the VHF (very high frequency) radio, which enables links with the shore or with another boat and the AIS system (Automatic Identification System), which allows the identification of each ship in the area.

GPS

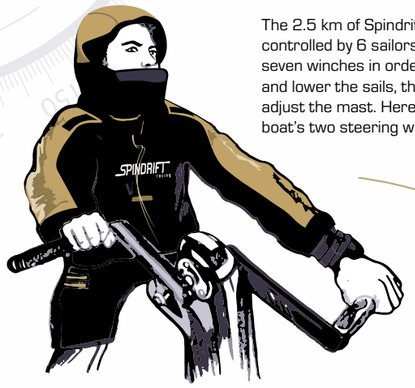
The Global Positioning System determines, to within several metres, the position of the boat, thanks to several satellites positioned at an altitude of 25,000 km. These satellites emit radio signals and the principle rests on measuring the time from when the radio wave is emitted in space by the satellite and received the receiver - the boat. When the boat moves away from the satellite, the wave-length of the signal increases. If it comes closer, it decreases.

ONBOARD ENERGY

In order to supply energy for all the electronic items used in navigation, the maxi-trimaran is equipped with six batteries. To recharge these, the boat has photovoltaic panels, which cover five square metres of the surface of the cockpit coachroof. They are made up of numerous cells, which contain miniscule grains of silica. The sun's rays penetrate the cells and agitate the grains, which creates electricity. Spindrift 2 is moving towards self-sufficiency in energy and over time aims to be able to provide its total requirement for energy using green energies.

SPINDRIFT 2

LIFE ON BOARD DURING THE JULES VERNE TROPHY



The Cockpit

The 2.5 km of Spindrift 2's ropes are controlled by 6 sailors, three grinders and seven winches in order to be able to raise and lower the sails, the foils, the keel and to adjust the mast. Here you also find the boat's two steering wheels.

The Galley

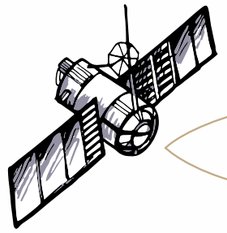
500 kilos of food are taken on board to last the crew of 12 people 43 days (1 kg per day per person)
The on-board food is freeze-dried in order to save weight. It is composed of dehydrated ready prepared dishes that only need the addition of hot water!
With regard to drinking water, the sailors use a desalinator, which extracts salt from the sea water.

The Mast

The mast measures 37.7 metres and weighs 1.6 tonnes. It is large enough for a sailor to climb up inside it. It can be moved laterally in order to increase the power and it supports weights of up to 80 tonnes.

The Cuddy

The sheltered area of the cockpit where the crew manoeuvre and stay on 'stand-by' ready to react when required.

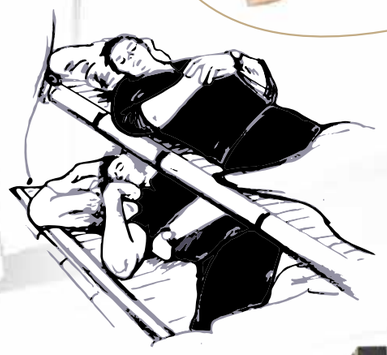


The 'Fleet' Antennae

These antennae enable satellite communication with land, the use of the internet or telephone as well as transmitting photos and videos from the boat.

The Bunks

A simple framework of carbon with material stretched over it, the bunk is not exclusive to one individual. The crew members change at each resting watch and take the place of those that will replace them in the cockpit and a label on each bunk with avoids waking up the wrong person! The sailors sleep here according to their duties for 3 hours in every 8 hours.

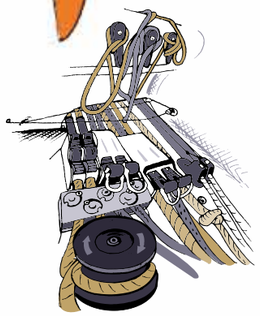


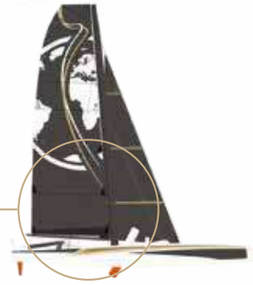
The Pits

The two pits each side of the coachroof form the nerve centre for the manouvres onboard Here are grouped the 40 ropes, known as the sheets, which are activated by four of Spindrift 2's seven winches to adjust the sails, the keel, the foils...The forces exerted on each of these sheets can be several tonnes.

The Chart Table

This is where the skipper, who has overall responsibility for the crew and the boat, meets with the navigator who is in regular contact with the shore-based Router.
The navigator analyses the Router's data and studies the best route to take as a function of the actual conditions of navigation (winds, sea state, icebergs...)





SPINDRIFT 2
BRED FOR RECORDS

40 metres long, 23 metres beam, 37.7 metre-high mast: *Spindrift 2* is the largest racing trimaran in the world.

Spindrift 2 , formerly Banque Populaire V, is a holder of ocean-going records including the Jules Verne Trophy in 2012. Loic Peyron was at the helm and, with his crew, they encircled the globe in 45 days.

Yann Guichard and Dona Bertarelli with their 12 crew tried to improve on this record time during their first attempt around the world in winter 2015-2016. The unfavourable weather at the end of the race prevented them from fulfilling this objective but even so they notched up the third best time in history with 47 days 10 hours 59 minutes and 02 seconds of navigation.

Changed since the 2015-2016 attempt, was to re-fit its original mast, which had been shortened and adapted in 2014 for the 'Route du Rhum' race. The boat is therefore 500 kgs lighter and the improved structure of the new shorter mast makes it 25% lighter than the original.

This new carbon spar has meant that the maxi-trimaran lost some sail area but it has gained manoeuverability. This smaller mast has also involved some changes for the crew and for the riggers have had to adapt to the deck layout of *Spindrift 2.*

REMEMBER!

Multihulls are much faster than monohulls; they are also know as the 'Formula 1 of the seas' and can reach speeds of more than 30 knots (55 km/hour).

SPINDRIFT 2'S TIMINGS IN 2014-2016

Yann Guichard *Spindrift 2 - Round the world - 47 days 10 hours 59 mins 02 secs*

Dona Bertarelli: second fastest female navigator around the world

Time Ushant to Tasmania: 20 days 4 hours 37 mins

Time Ushant to Cape Horn: 30 days 4 hours 07 mins.

SPINDRIFT 2'S TIMING IN 2018-2019

Time Ushant to Equator : 4 days 20 hours 7 mins

WHAT IS A MAXI-TRIMARAN?

A trimaran is a multi hull vessel (as opposed to a mono-hull, with only one hull.) The main aim of multi-hulls is to increase the power of the boat thanks to its width and the sail surface. These two parameters translate into an increase in top speed. Taking account of its larger than normal size, *Spindrift 2* is considered to be a maxi-trimaran.

The aerodynamics have been improved thanks to an elongated coachroof and the replacement of some lines by tarpaulin fairings to improve performance. After the experience of the previous round the world voyage, the team's design office has worked on improvements to performance for this attempt. In total, a team of twenty technicians have made the necessary checks and carried out modifications, particularly to the interior and exterior layouts.

The team has also developed a foil with new tips (a new fin on the lower part of the foil), which now points upwards and allows the bow to be lifted. The foils put additional vertical pressure on the bow, so the team worked on **new T-shaped rudder blades**. The combined action of the foil and the rudder blades improves the vertical pressure on the hull, and therefore helps to reduce drag on the boat.

With a view to protecting the environment, Spindrift racing also focuses on becoming as self-sufficient as possible in terms of energy. To this end engineers have looked at exploiting the available surfaces exposed to the sun on the coachroof of the boat and installed five square metres of solar panels, that are able to recharge the batteries that run the electronic equipment onboard *Spindrift 2*.

For 2019 – 2020 the aim is to beat the Jules Verne Trophy record established in January 2017 of 40 days, 23 hours, 30 minutes and 30 seconds.

THE CREW: ONBOARD AND ONSHORE

ONBOARD

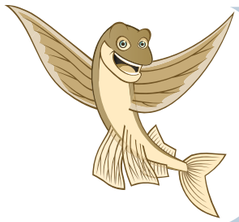
SKIPPER (1)
Has the responsibility for the crew and for the boat; he sets the pace and makes the final decisions.

WATCH CAPTAINS (3)
They are responsible for their teams on deck.

HELMSMEN-TRIMMERS (12)
By default, each of the 12 sailors take the helm in turn. When the average speed is very high (around about 35-40 knots), it is imperative to stay alert so the helmsmen is replaced every 20-30 minutes.
The crew onboard have a permanent team in the cockpit, day and night, so they can adjust the trimaran's huge sails (1,130 square metres maximum sail area) as required by the weather conditions.

NAVIGATOR (1)
He works at the chart table and is in regular contact with the shore-based Router, who sends meteorological and strategic analysis to the navigator who, with the skipper, determine the best route to follow.

BOW (3)
These work at the bow of the three hulls of the trimaran, the most exposed area on *Spindrift 2*. They also climb to the top of the mast when necessary.



There are 12 sailors to manoeuvre the largest trimaran in the world. For efficiency, each has a pre-arranged role and sometimes an additional responsibility onboard, whether technical or medical.

For its part, the shore-based team makes all the necessary arrangements beforehand and during the race so that the boat and the crew can work at their maximum capacity.

ON SHORE

THE ROUTER
A formidable asset in the conquest of a record such as the Jules Verne Trophy. Jean-Yves Bernot, navigator and the principal world expert on course plotting and meteorology for the racers at sea, nicknamed 'the wizard', he has been involved in many successful campaigns.

RACE HQ
The control tower ashore during the attempt on the record. The team technicians are on stand by, ready to help the boat resolve technical problems whilst the rest of the *Spindrift 2* team relay information received from the boat to the families, public and the media and have an overview on the progress of the record attempt.

YANN GUICHARD

YANN GUICHARD, SKIPPER

Born 23 May 1974 in Paris
Second attempt at the Jules Verne Trophy

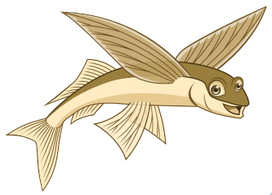
Originally from Ile aux Moines in Brittany, Yann Guichard is one of the most talented sailors of his generation. He has an impressive sailing record and in particular with multihulls.

From the demanding high level of Olympic sailing, synonymous with discipline, rigour and organisation, he has succeeded in realising his aspirations through work and perseverance. His passion for multihulls has led him to lead several major projects.

Talented and multi-skilled, he has accumulated performances and victories on several circuits, as much in ocean racing as in inshore regattas (Route du Rhum, Transat Quebec Saint Malo, Transat Jacques Vabre, Extreme Sailing Series, America's Cup World Series, World Match Racing Tour, D35 Trophy...)

Yann is also a leader, who knows how to surround himself with a team ready to take on new challenges. The Spindrift racing team, which he created with his partner Dona Bertarelli, and record campaigns with the maxi-trimaran *Spindrift 2* in particular, are his passion. A devotee of meteorology and its sometimes complex phenomena, he remains very involved in the navigaton and the strategy of the route whether offshore or inshore.

In the winter of 2015-2016 that Yann Guichard and his team completed their first attempt at the Jules Verne Trophy with the third best time in its history in 47 days 10 hours 59 minutes and 02 seconds and set a new record Ushant to Equator in 4 days 20 hours and 7 minutes during the 2018-2019 attempt.



REMEMBER!

Equality of the sexes: 200 years ago women had no right to board a boat! It was thought that, like rabbits, their presence onboard brought bad luck to the ships and their crews. Towards the end of the 1980's there was a marked greater equality in the sport and women started to become an integral part of ocean racing, with the likes of Florence Arthaud, Isabelle Autissier, Ellen MacArthur, Tracy Edwards, Sam Davies, and Dona Bertarelli...

WOMEN AND THE JULES VERNE TROPHY

Several women have attempted the Jules Verne Trophy but, to date, none have succeeded in carrying off the trophy.

DONA BERTARELLI

Sailing has always played a part in the world of this businesswoman, philanthropist and sailor. Competitive racing became a reality at the end of 2006 when she formed a female crew on the catamaran circuit on Lake Geneva. In 2010, at the helm of Ladycat , she became the first female sailor to win the prestigious 'Bol d'Or Mirabaud' and the following year she created Spindrift racing with Yann Guichard, a racing team dedicated to nurture their nautical ambitions. Involved in a number of foundations, one of which is dedicated to the conservation of the marine environment, in 2013 Dona Bertarelli discovered offshore multihull sailing onboard *Spindrift 2*. **This female sailor became the fastest woman around the world during the Jules Verne Trophy 2015–2016.** This year she will be involved at the heart of the operational team ashore.

'It is nothing trivial to travel so far and for so long, to concentrate on one goal and to recreate a world with 14 people over 40 days, reflecting that the occupants of the international space station were our closest neighbours when we were in the middle of the Pacific. To be a team, you have to able to depend on one another, help each other, accept that there will be highs and lows, and find a balance to be able to succeed together.'
D.B.

TRACY EDWARDS

In 1989 at the age of 23, Tracy Edwards led the first all-female team in the 'Whitbread Round the World Yacht Race'. She became internationally recognised finishing second in the general classification of her category.
Tracy Edward then took part in the Jules Verne Trophy aboard *Royal Sun Alliance*, still with an all-female crew. However, dismasted off Chile but she and her crew somehow managed to save the boat and bring it into port.

ELLEN MACARTHUR

Ellen MacArthur is a British sailor who became well known when she finished second in the 2000 – 2001 Vendee Globe. In 2005 she beat **record to sail solo round the world in 'Solitaire', with a time of 71 days 14 hours 18 minutes and 33 seconds.** That same year she was honoured by Queen Elizabeth II. Very aware of ecological problems, in 2010 she created the Ellen MacArthur Foundation with the aim of getting the public and companies to re-think, develop and build a self-sufficient future by utilising the concept of a circular economy.

Here we must mention **Florence Arthaud**, who died tragically on 9 March 2015. Even though she did not sail in this round the world challenge, she was a co-founder of the Jules Verne Trophy.

ATHLETES IN EXTREME CONDITIONS

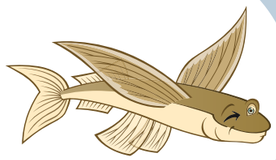
Referring to beating speed records, also means thinking about physical performance. To ensure that the maxi-trimaran *Spindrift 2* achieves its full potential, demands that the crew has to be at the peak of physical fitness.

The sailors must be fit for hoisting the sails, moving around the boat, repairing damage, but importantly, able to maintain this rhythm over several weeks, sometimes in extreme conditions!

Sailors are high-level athletes, physically as well as psychologically. They are in training throughout the year, either by building core strength as well as other physical and sporting activities..

To keep going for the length of the challenge, they also need to eat correctly with a balanced diet that gives them the nutrients to be able to manage the high output of energy required to manouvre the boat and, at the same time help them to withstand the cold.

However, as this is a speed record, to be fast the boat must be as light as possible. All excess weight is removed. As a result, the type of food loaded onboard has been adapted and the portions are freeze-dried.



REMEMBER!
The sailors who try to beat the record for the Jules Verne Trophy are high-level athletes who must eat and train in the best way to optimise performance of the boat whatever the meteorological conditions.

SAFETY ONBOARD

Being responsible and having good seamanship are two essential qualities whether it be sailing offshore or inshore. Each member of the crew must be aware of the dangers in order to anticipate them to the best of their abilities and thus reduce risk.

Safety is the paramount responsibility of the skipper. Whether on land or at sea, he has to give clear instructions on a daily basis and make sure that everyone respects these rules. During the round the world race, there are regular checks to ensure best maritime practice.

Onboard, each sailor is equipped with a safety kit: a pouch containing an individual beacon, distress flares, a tube of fluorescein, a waterproof survival suit, an inflatable vest and a light.

To avoid a crew member falling overboard a safety line is installed the length of the trimaran, known as the '**life-line**'. It allows each sailor going onto the foredeck of the boat to be clipped on to this line with the aid of a harness that they wear around their waist.

ONBOARD MEDIC

When a sailor is hurt another crewmember onboard will treat them if the boat is too isolated out at sea. All members of the crew have prior training in first aid: applying a bandage, suturing a cut, treating a tooth, calming a stomach ache...

The first aid pack contains the necessary first aid items: plasters, bandages and pain relief, antibiotics as well as equipment for treating a minor injury.

ONBOARD MEALS

Food is as important to the success of the project as the technical preparation of the boat. The sailors must enjoy eating and mealtimes are moments of team building..

VICTUALLING/PACKAGING

In the days before the start of the 'stand by' period the team loads the victuals onboard. The food taken onboard is calculated for a period of 40 days and the meals are packed in sacks, which correspond to a daily ration for the whole crew.
Whilst the sailors can benefit from fresh produce for the first few weeks (fruit, bread...) two thirds of the food is freeze-dried. Freeze-dried food is preferred because it offers considerable advantages for offshore racing. It is light (half, or even one third, the weight), takes up little room, can keep for a long period and remains relatively easy to prepare.
Five minutes is sufficient to boil some water and add it to a sachet.

It is equally very important that the food is balanced and rich in calories as one person working on a boat consumes twice as many calories as a sedentary person. Freeze-dried food also meets these requirements.

NUTRITIONAL REQUIREMENTS AT SEA

The issue for the offshore sailor is to find a good nutritional balance to take account of the phases of exertion, alterness and management on the boat: a balanced cocktail of proteins, complex carbohydrates and essential fatty acids. If the carbohydrates favour sleep, a mix rich in protein improves vigilance – therefore food becomes a real fuel.

The daily nutritional requirements of a sedentary adult male are 2,200 – 2,700 calories; a sailor needs about 5,500 calories per day to meet the efforts and conditions of the race.

Nutritionists prepared menus, which meet the energy needs and are to the taste of the sailors and the geographical zone in which they sail. Energy requirements differ according to the zones crossed: **in cold zones each sailor consumes 5,500 calories daily, in temperate zones 4,500 calories and in hot zones 3,500 calories.**

So in the cold climate of the southern oceans, sailors eat one extra meal, morning and evening, made up of dried fruit, oily seeds and air-dried and pressed meat from Grisons [Switzerland].

FREEZE-DRIED FOOD

Freeze drying is a process that involves removing water from a foodstuff in order to conserve it better. Onboard, sailors eat this type of food mainly because of concerns about storage.

It's not easy to cook on a maxi-trimaran crashing about in perpetual motion but everything is organised by the shore team!

A mini-galley is fitted out in the interior of the boat in order to be able to boil water to make the freeze-dried food hot. The sailors have to be careful as freeze dried foods lack minerals when rehydrated with desalinated water.

Even though a sailor eats and lives in a damp environment, the body will lose water when using energy; they must therefore drink enough to keep hydrated.

Each yacht is equipped with a desalinator so as not to weigh the boat down with bottled water

REMEMBER!
Freeze dried food takes up less space on a boat, it weighs less and takes less time to prepare. It is easier to manage the waste. The desalinator is the only source of fresh drinking water and sailors drink 60 litres daily between them.

SLEEPING ONBOARD

Sleep takes up more than one third of our life. It is necessary for growth, development of the brain and for our physical and mental recuperation. In order to beat the record for the Jules Verne Trophy, the team must 'forget' their habits and work to a system of watches.

Ashore, an adult's sleep is divided into different periods of around 90 minutes each. Sleep is made up of 75% deep sleep and 25% active sleep - *Non-Rapid Eye Movement (NREM) and Rapid Eye Movement (REM)*

At sea, the crew of *Spindrift 2* cannot maintain a one-stage sleep, or one solid sleep through the night. For the boat's performance, the crew works in relays on deck, day and night and has scheduled rest periods. This is known as the watch system.

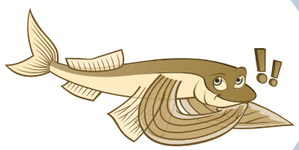
- the sailors are 'on watch' for 3 hours and must be on deck for helming and manoeuvering
- then they are on 'stand by' for 45 minutes, dressed and ready for manoeuvres if required
- then they have 3 hours rest during which time they can sleep, change clothes and eat
- finally, for another period of 45 minutes they must be up and dressed and ready for manoeuvering if required

If all is going well then the rest period is devoted to sleeping, eating or relaxing. However, in case of manoeuvres or extreme weather conditions, the sailors are on "stand-by", postponing the rest period until later and come and work on deck. The rhythm of the Jules Verne Trophy obliges the crew to limit periods of recuperation.

You have to imagine the three hours maximum of sleep on the 'watches' in basic bunks, listing at 30° or with the boat doing 30 knots hitting the waves so the carbon hull picks up and amplifies the noise.

The sailors accustom themselves to polyphasic sleep during their months ashore so they are used to sleeping in short bursts.

If, when onboard, they don't get enough sleep it affects their cognitive performance first. Their capacity for thought and analysis is much weaker as the brain performs less well.



REMEMBER!

On land under "normal" living conditions an adult sleeps between 7 and 9 hours a night in one go. This is called monophasic sleep. At sea, to be efficient and take over on deck, the sailors have polyphasic sleep with their days split into watches.

Dona Bertarelli

Sleeping at Sea

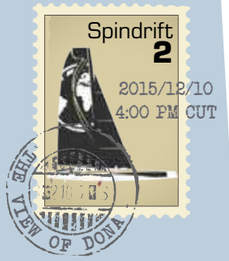
We are now more than two weeks living with the watch system, linked periods of three hours of sleep, five hours of work, three hours of sleep and so on. Have we followed special training to get to this?

No, in our case, you can't train for it ashore. The work onboard is so physically and mentally demanding that the body, after several days at sea, rapidly gets used to these conditions. But it is not a subject to be taken lightly and we remain alert to each other's state of tiredness. This can get complicated if the navigational conditions are difficult and the watch system gets upset, as some manoeuvres take time and require the whole crew to be on deck.

Some years ago sailors took part in a study of sleep. It proved that in the case of extreme fatigue, only the body can recuperate given a short siesta. It needs a much longer period of sleep for the brain to recover in its turn.

Sleep (as long as you are eating well and not sea sick, something that happens even to professional sailors) is essential for finding a balance and to be able to sustain a rhythm, which must be maintained over several weeks whilst remaining effective. However, it is true that tiredness builds up and, once returned ashore, it sometimes can take days and even weeks for total recuperation.

Dona



THE SLEEP OF SEA BIRDS

The numerous migrating and sea birds such as the swift, the frigate bird or the albatross, sleep on the wing in relatively short bursts. These birds eat in flight and can cover hundreds of kilometres without touching down. Swifts group together and sleep in a circle, and can glide during their sleep periods. As for Frigate birds, flying up to 1,500 metres high, they use their huge wings to face the wind, immobile, their hearts slowing right down.

Recent research is still unable to give all the answers, however two theories exist: the first that these birds are be capable of putting to sleep their left and right cerebral hemispheres alternatively; so half the brain is awake, the other half asleep; the second theory is that they can alternate phases of sleep and waking very quickly.

ONBOARD HYGIENE

To wash yourself when sailing onboard a maxi-trimaran the size of *Spindrift 2* is not easy. Facilities are reduced to a minimum to save weight onboard.

WASHING YOURSELF

There is no shower onboard, just a very small washbasin enables the crew to have a small wash and for cooking. During good weather and when the boat isn't pitching too much, a bucket of seawater suffices for proper hygiene. It's a question of just washing the essential.

Once ashore, the sailors usually need a really good wash to get rid of all the salt on their skin and in their hair.

To go to the toilet, sailors use a bucket and a bag made of starch, which they then throw away into the sea through the port hole. The bag takes a day to break down naturally in the sea. However, all the sailors will tell you that the sea swell and the speed of the boat can make this task almost impossible!

THE FIGHT AGAINST MOISTURE

The main enemy for sailors during a race is moisture. It is important to wear clothing made from antibacterial material which lets the skin breathe in order to counteract potential infections linked to fungal infections.

CLEANING INSIDE THE BOAT

When sailing for several weeks it is important to keep the boat tidy and clean.

The sailors regularly take the time to clean their very cramped living quarters with washing up liquid or a bleach-type cleaner.

As all the kit brought onboard can shift around a lot it is very important to tidy up regularly.

A *SPINDRIFT 2* SAILOR'S WARDROBE

In terms of clothing, the complexity of a round the world trip means that the sailors travel from very hot climates at the equator to very cold and windy near to Antarctica and Cape Horn. Therefore they need to take onboard clothing to cope with these conditions as well as weight to a minimum and have good quality clothing that can withstand 40 days under extreme conditions, without being washed.

So, the answer is to wear several layers of clothing:

1ST BASE LAYER

Very much like ski underwear. They are designed to wick sweat quickly and therefore reduces damp (which causes them to feel cold). They must be worn in contact with the skin be able to absorb moisture and dry rapidly.

They are generally made of a synthetic material such as polyester or, in our particular case, merino wool, which also has the benefit of being warmer and is naturally antibacterial in order to prevent bad smells - useful when there is no shower onboard for more than 40 days!

2ND INSULATION LAYER

Made for maximum insulation from the cold by trapping layers of air, a perfect natural insulator! It is made of a synthetic material, Polartec, very warm, light, quick drying and excellent at wicking damp (sweat) through to the upper layer.

3RD PROTECTIVE LAYER

The aim is to protect from wind, rain and spray. It must be extremely waterproof, durable and breathable to wick away sweat. In our case it is made with a membrane similar to Gore-Tex, in gold and black, a special livery developed for Spindrift racing. This is what we our call 'waterproofs' or 'foul weather gear'.

Sailors take great care to wear the proper clothing for the job that they are doing onboard. There are no heaters to dry clothing, and clothes wet with seawater dry very slowly as the salt crystals retain water.
The sailors spend about 20 days in water that rarely gets above 10 degrees and, with wind chill, temperatures feel below 0 degrees. Therefore the quality and durability of the clothing taken onboard plays a decisive role in the crews' performance.

Clothing a *Spindrift 2* sailor: 4 sets of merino wool underwear for the base layer, 1 jacket, 2 pairs salopettes, 2 pairs shorts and a polar outfit for the second layer, 2 jackets and one pair salopettes for the third layer. The sailors also have numerous accessories to protect them from the wind, rain, spray and cold: hoods, neck warmers, hats, socks and over-socks, boots, a sleeping bag and a sleeping bag cover, helmet, thermal face mask...

DICTIONARY OF MARINE TERMS

This glossary is a compendium of marine terms used in the world of sailing and offshore racing. There are numerous French expressions inspired by the sea, such as “laugh like a whale”= “laugh like a drain” or “look out for squalls” = ”keep an eye out for trouble”

40s rugissants/Roaring Forties: an expression used for latitudes between the 40th and 50th parallels in the southern hemisphere, named because of the strong winds found here

50s hurlants/Furious Fifties: an expression used for latitudes between the 50th and 60th parallels in the southern hemisphere, named because of the strong winds found here. This is the zone where Cape Horn is located.

Accastillage/Fittings: All the elements of the deck of the boat that allow the manoeuvre (carabineers, shackles, pulleys, etc.).

Acoster/Moor: position a boat alongside a quay or another ship.

Affaler/Lower: to haul down a sail quickly (the opposite of hoisting)

Allure/Speed: the passage of a ship in relation to the wind. Sailing downwind corresponds to a wind from behind the stern of a boat.

Amer/Landmark: a notable point ashore which is good for navigating by. These sea marks are found on charts.

Au Pres/Au Portant // Upwind/downwind: pace at which the boat is navigated. “Upwind“ the boat travels into the wind; “Downwind” when the boat travels with the wind behind it. A ‘cross wind’ comes against the side of the boat.

Avitaillement/Victualling: the food loaded onboard

Bâbord/Port: the left side of a ship looking forward

Ballast/Ballast: the permanent ballast enables management of the boat’s stability, trim or list.

Balisage/Buoyage : all the marks or buoys, fixed or floating, placed in the sea or on land which indicate dangers to shipping dangers and the way through an access channel to ports and havens

Barreur/Helmsman: a crew member who takes the wheel, and keeps the boat on the chosen course.

Bathymétrie/ Bathymetry: study of the depth of the oceans and the contours of the oceans’ seabed.

Bio-composite/Bio-composite: materials made from vegetable sources such as linen or flax that can replace synthetic fibres (glass fibre, carbon fibre). This type of material can be recycled.

Cabotage/Coastal navigation: Coastal navigation over short distances; usually close in to the coast

Démâter/Dismast: to take down or accidentally lose all or part of the masts.

Dérive/Leeway: Flat surface, submerged, in line with the longitudinal plan of rhe ship, allows resistance to drift due to wind

Dériver/Drift: to drift away from the desired direction, for a boat, under the force of the wind or the action of a current.

Dessalinateur/Desalinator: The desalinization of water is a process by which fresh water is obtained from brackish or salt water. This kit means they don’t have to take a large quantity of fresh water onboard and so keep the weight of the boat down so it can go faster.

Échelle de Beaufort/Beaufort Scale: expresses the speed of the wind according to a scale from 1 – 12. The British Admiral Francis Beaufort invented this scale in 1806.

Étrave/Bow: the forward part of a yacht (or the prow on a sailing ship)

Fibre de carbone/Carbon Fiber: a material obtained from graphite, used in naval construction, cars or planes because of its qualities of lightness and strength.

GPS/GPS: Global Positioning System which allows you to find your position wherever you are in the world.

Gréement/Rigging: all the equipment which allows the wind to be captured for the sails (mast, cables, ropes etc)

Growler/Growler: a piece of drifting ice from an iceberg; risks damaging a boat on impact.

Hauban/Cable: placed at each side of the mast to keep it upright.

Hisser/Raising the sail: the manoeuvre to raise a sail.

Jauge (de course)/Rating (for racing): These are rules established by the body involved in the organization of nautical competitions. The ratings are used to evaluate the performances of large sailing ships of different design in order to give them, if necessary, a ‘sporting handicap’ which allows for the fairest possible final placings.

Latitude/Latitude: in degrees, the position of a point on earth north or south of the equator.

Longitude/Longitude: in degrees, the east or west position of a point on earth.

Lyophiisé/Freeze-Dried: a process that allows the water to be drawn out of foodstuff. This facilitates its long-term storage and also much reduces its weight.

Media-Man/Mediaman: the person onboard who takes photos and videos during the voyage and regularly sends them ashore. A sort of floating journalist.

Mille (Mille marin ou mille nautique)/Nautical Miles: a unit of distance used at sea, equivalent to 1,852 metres. Not to be confused with the English mile (1,609 metres).

OFNI/UFO: Unidentifiable Floating Object such as a container, a log of wood, a tree, a plank. Seriously dangerous when in collision with a boat.

PC course/Race HQ: the headquarters for the race, managing the hazards of the race (following the boats, weather analysis, providing help if required, logistics etc.).

Portulan/Portulan: forefather of the modern marine chart indicating ports and coastlines more precisely than sea routes.

Pot au noir/Doldrums: describes the zone of several hundred kilometres at the level of the equator, which encircles the Earth. Here zones of very weak winds alternate with showery and windy squalls. Very often difficult areas to manage for sailors in a race. Subtropical Convergence Zone

Quille/Keel: Boat’s counterweight, made of lead, located under the hull; prevents the boat from capsizing.

Routage/Race Router: assistance for a race boat by a specialist in meteorology ashore who advises the crew on its choice of tactics for the route to take in order to find the most favourable weather conditions. Authorised only for certain races.

Safran/Rudder: The rudder provides steerage and direction

Sextant/Sextant: instrument with one sixth of a circle (60°) used to measure angles in order to find the position of a boat.

Tribord/Starboard: the right hand side of a ship looking forward

VFI (Veste à Flottabilité integrée)/PFD: Personal Flotation Device - a life jacket which inflates automatically when the wearer falls into the water. It is easier to wear than a classic life jacket

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