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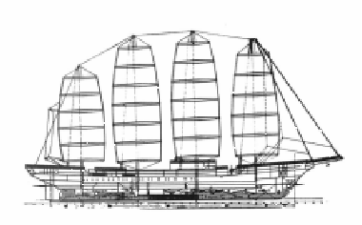
Entwicklung alternativer Energien
Insbesondere Windenergie



Information about modern sailing vessels

In a way I had planed an other kind of lecture:

- the usual indication to the climate
- the world wide pollution
- the pollution by ships
- Simultaneously the main emphasis of shipping in the international trade.

Than I realized that it might be better to present a single special topic. – The usual topics and arguments are too often presented and always repetition is not very helpful.

So my aim is to specify precisely in the case of a Bulkcarrier carrying ore from Brazil to China, how a modern sailing vessel could be helpful. I have chosen ore because this is the most transported cargo in terms pf quantity in the international trade. Even more than coal or grain.

Some say, that God should have been a ship-owner, because mineral wealth are located so far from the user and in between there is a lot of water to transport them.

Above all:

- No farmer would expect, that the weather forecast will tell him on the beginning of the year, what the weather is to be like on the 22. June. The temperature, the humidity, the wind etc. etc. only because he intend to start on this day the harvesting of hey. Neither they can tell him, how the weather will be in the next seven days. Or the time he will need to do his work.
- By the way no farmer would ask for this.

- Likewise it is impossible to predict on the long term the weather conditions for a certain sea area. This can be done only short term, based on the actual weather situation.

- However, the farmer can assume, due to weather observations of many hundreds of years that in the summertime there will probably be a period of good weather for his hey.

- Likewise the seaman can assume from weather observations of long periods how the average wind and the weather will be likely in a certain sea area.
  Short term predictions are nowadays much better than in former times, due to better telecommunication and worldwide meteorological consultations.

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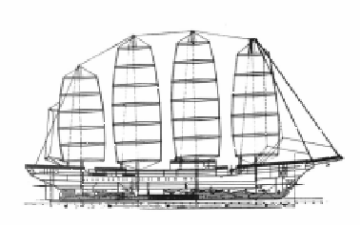

But I have to explain what I am talking about. I will show you a type of modern sailing vessel and the evidences of our assumptions.

Here you may see a type of sailing vessel designated to sail around Cape Horn.

Speaking about a cargo vessel, our said Bulkcarrier mentioned before and carrying ore, we do not need a bow sprit neither the fore sails. The arrangement of the masts will take care for good sailing conditions.

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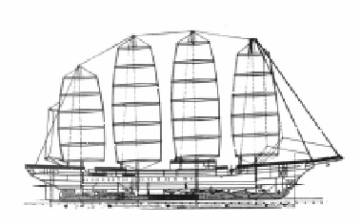

Here you shall take an impression of this type of Bulkcarrier.

A fully-rigged five-master.

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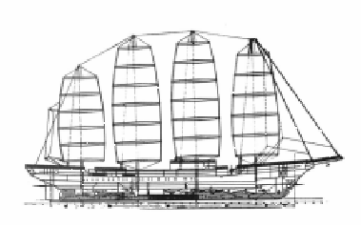

The starting point was the “Pinta”, a modern sailing vessel based on the technical concept of Wilhelm Prölss’ Dyna Rig of the 1960’s and the first of her kind designed according to my ideas in the years 1983 – 1986 with the then famous shipyard “Bremer Vulkan”.

Here you can see models being tested in the wind tunnel, as one single mast model, four mast model with and without fore sails. All configurations were carefully tested and evaluated.

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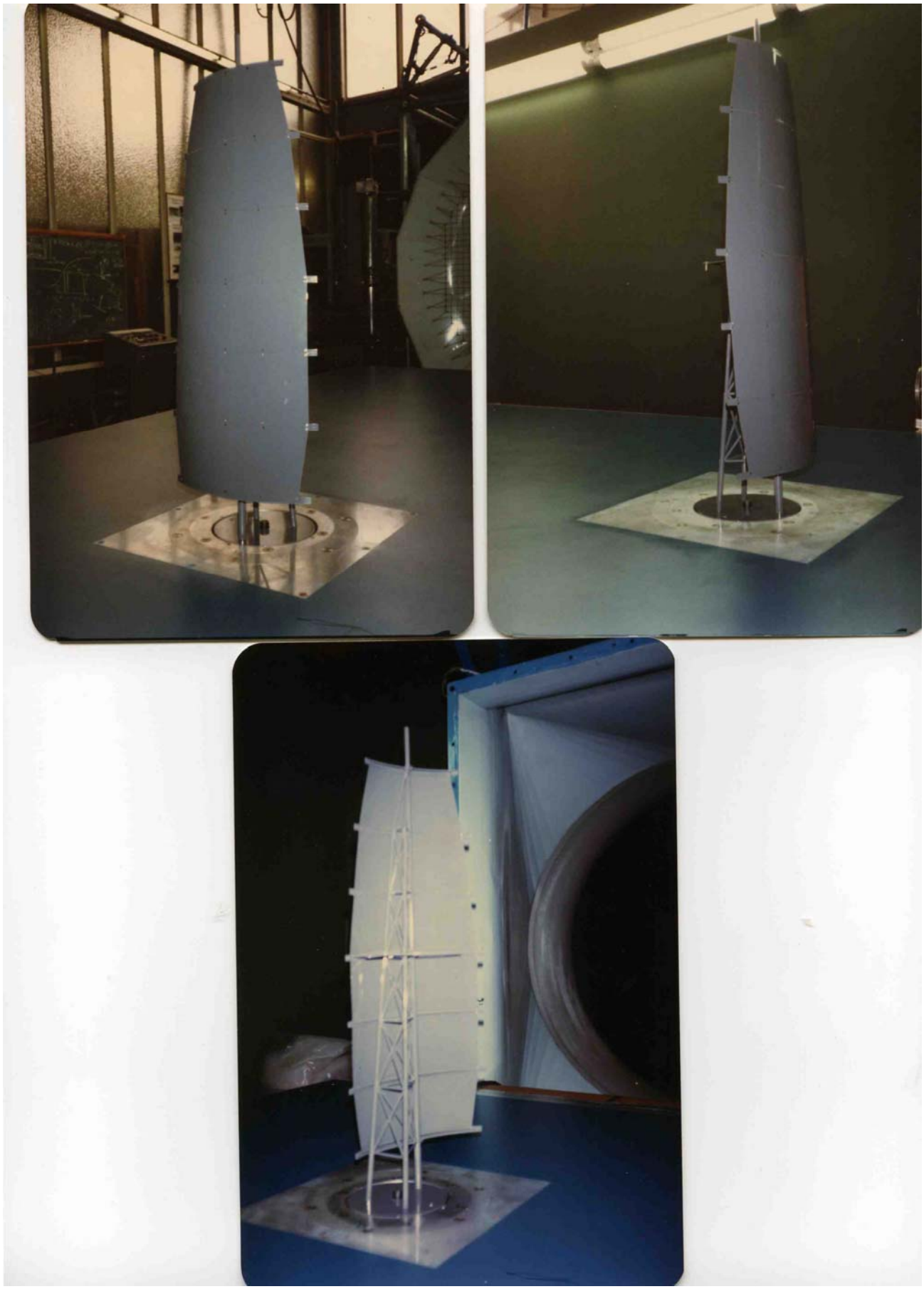

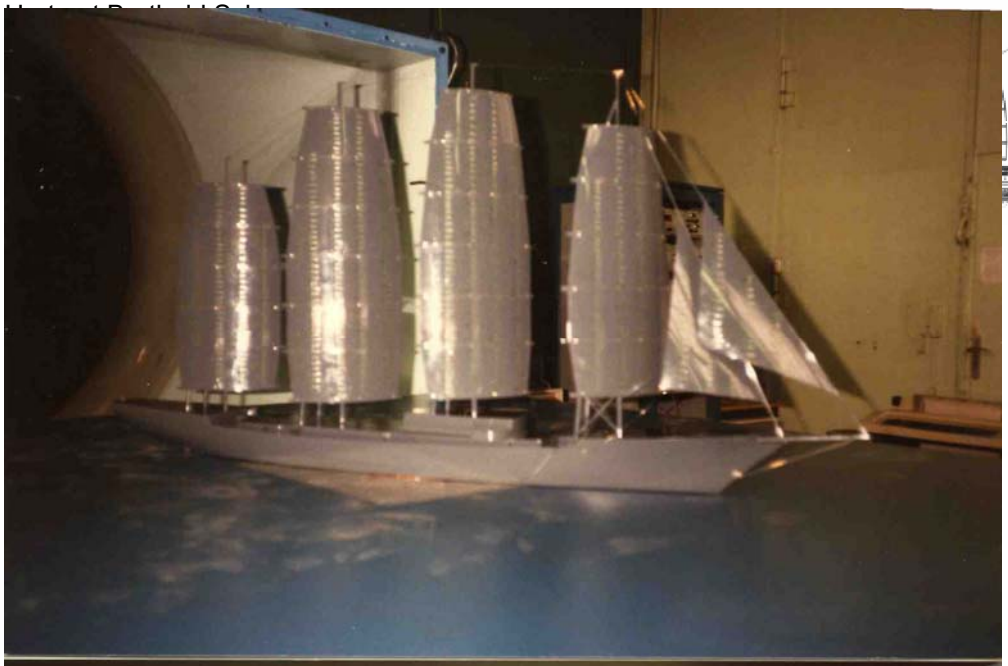

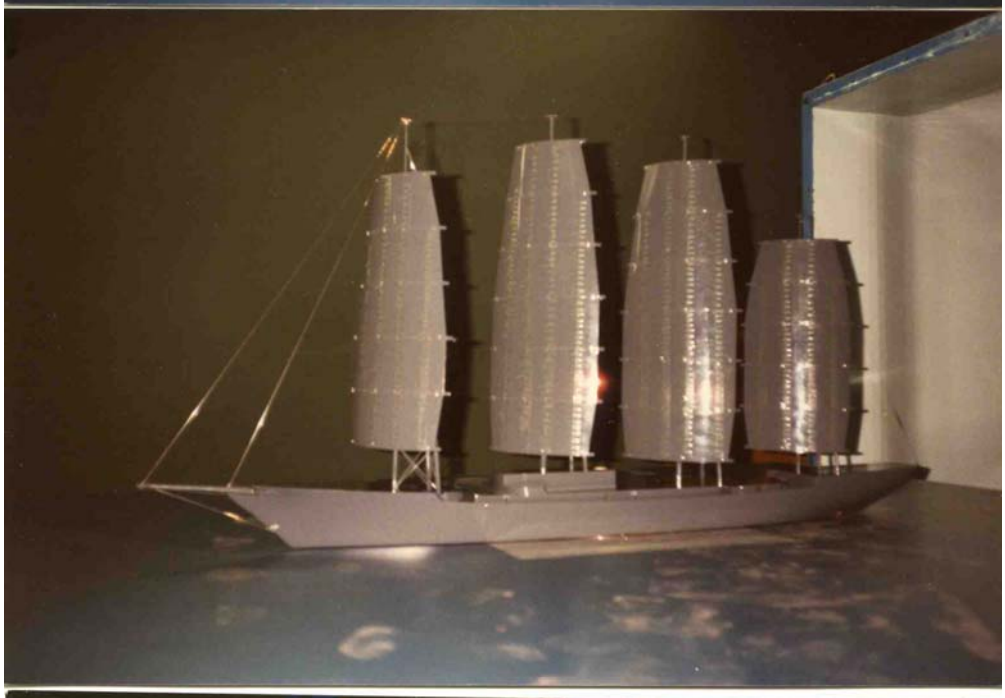

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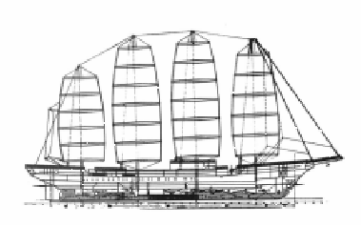

- Here we see the tests in the water tank of the HSVA. (Hamburg Ship Model Basin). The picture shows a remarkable hull with fairly high speed performance, because, even though going here with 20 knots no stern sea is visible. And it is well known that it is the stern sea which acts as a break.
- Two photos are put together.

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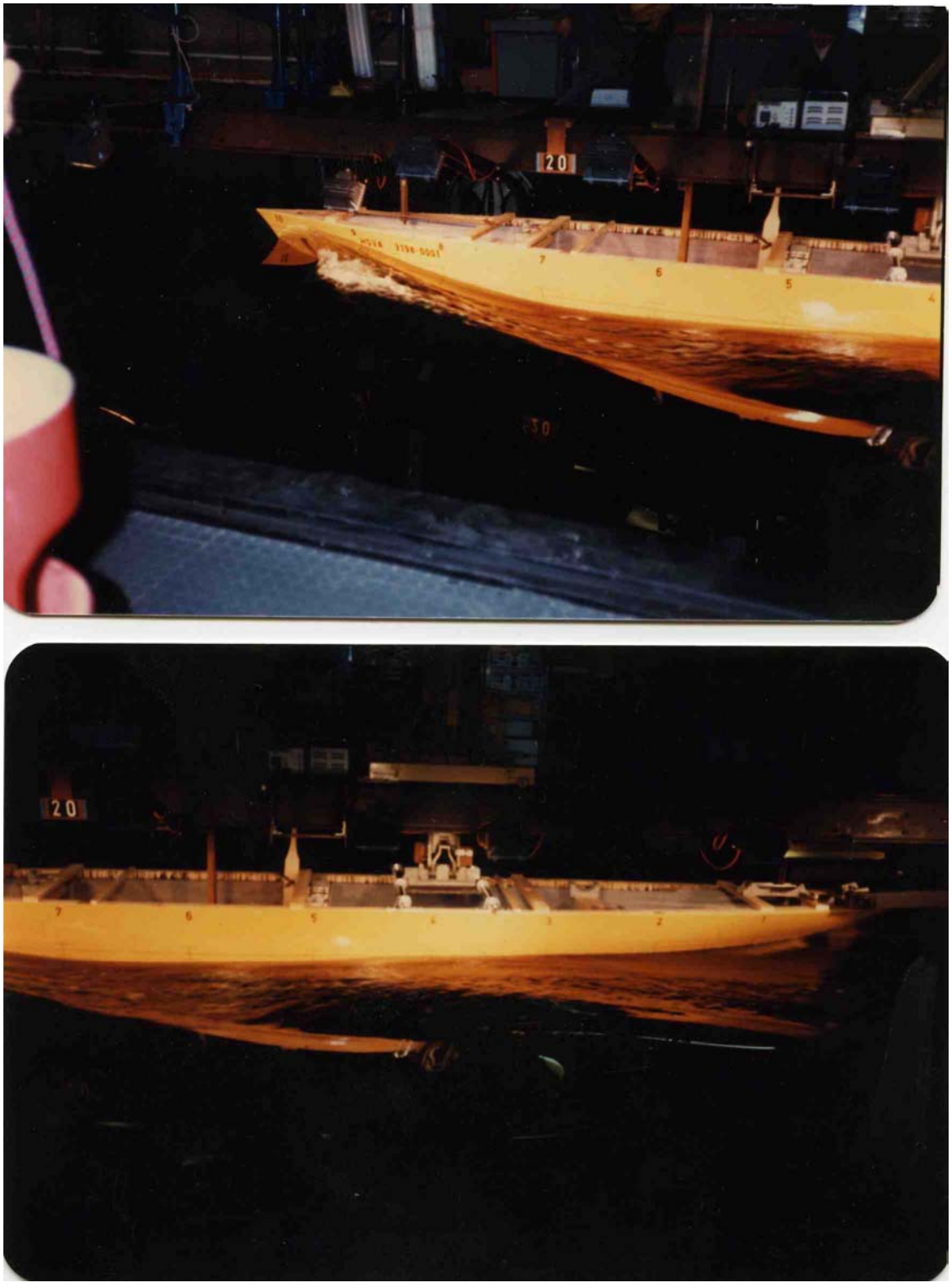

New materials have been tested in long time tests:

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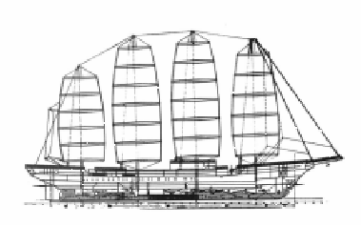
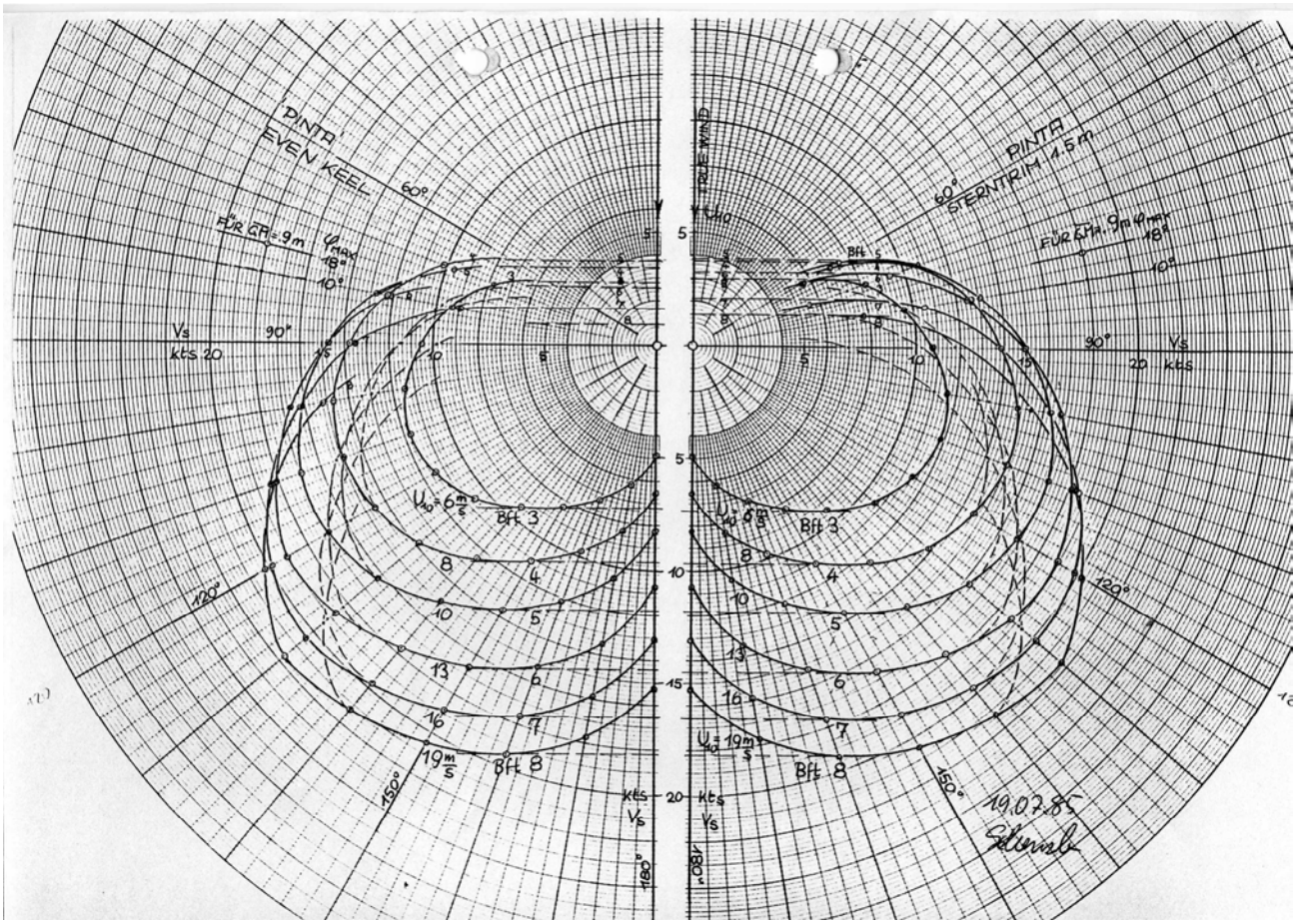


This sailing speed prediction by Peter Schenzle permits to estimate the achievable speeds of our sailing vessel, depending on the wind and the course steered in relation to the true wind.
As far as I follow the elegance of the lines tested in the tank, I can admit the figures mentioned here in this diagram.



<u>But back to our freight of ore:</u>

It seems that Brazil is the biggest Exporter of ore and China the biggest Importer.
Harbour of greatest importance in Brazil is Tubarao. Situated 28° 13’ 52’’ south and 48° 39’ 08’’ west.
Destination is Qingdao, China. Distance 11.422 nautical miles.

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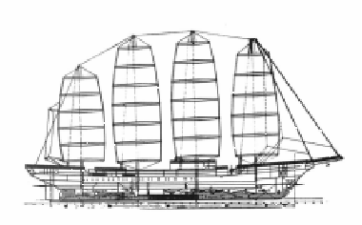

As mentioned above the distance between the two harbors is 11.422 nautical miles. A Bulkcarrier as usual of Panamax size will travel with a speed of app. 14 Knts and needs 34 days to join his destination.
During this time she consumes daily approx. 40 tons of bunkers. And bunker is a type of fuel witch will be forbidden in the next future due to his high pollution.

One fact in our consideration is of very great importance: Bunker is to be paid for!
But the wind is free!

When taking the prices of June 2008, which was 620, - $ US per metric ton, a motor driven Bulkcarrier consumes 24.800, - $ US per day. For the whole voyage to his destination she will consume a fuel equivalent of 843.200, - $ US or 616.000,- €.
I suggest that she will be provided by electrical power for the board net through a generator on the propeller shaft. If not, we would have to add extra diesel-generator and its consumption costs.

This was only one way. Now it is becoming worse. The unloaded ship must take ballast water in tanks and in the cargo holds to get the propeller submerged below water surface. This later on causes costs for cleaning and in spite of that, the ship offers a greater resistance than before and will probably need more bunker than for her first destination.
So we have to consider, that a Bulkcarrier of Panamax size driven as usual needs about 1, 5 million of Euro for one complete round trip.

So let us come back to our modern merchant sailing ship:
She is of the same size. And the coefficient of fineness is as shown in the tank tests above. So we may use the figures of the diagram and this will allow getting an idea of the approx. sailing speed of our ship.
During our sailing the propeller is milling by the speed through the water and a generator provides the whole ship with the electrical energy needed. This is proven and established procedure.

Our sailing ships will not have a main engine as usual, but 4 smaller diesel-generators of 400 KW being able, in a case of emergency, to drive the ship at 10 to 12 knots.
The space for cargo we loose by the coefficient of fineness we will get back by renunciation of the big engine room and by less tank capacity. – And the building costs of a sailing vessel could probably be less. (Exception is the prototype).

There exist “monthly charts” showing the wind and current conditions of sail areas. They let us estimate our speed.
I will show this to you on the next pages.

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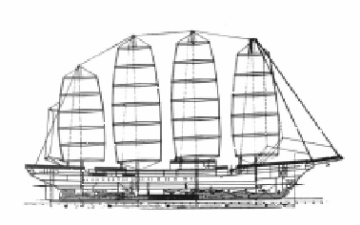

We concentrate on our sailing Bulkcarrier.

Our concept here is five masted Bulkcarrier. The sail area is 10.465 square meters, corresponding to 112.645 sqft.
Accepting that a square meter sailing area could generate 0, 3 to 0, 5 KW. It seems normal to accept that in areas of strong wind as the roaring forties a power of 0, 4 KW.
This adds up to 4.168 KW.
By reasonable placement of the masts and design of the hull (more draft astern) the helm angle would be moderate and the leeway too as well.

The result will be a fast ship using the existing forces of wind systems efficiently.

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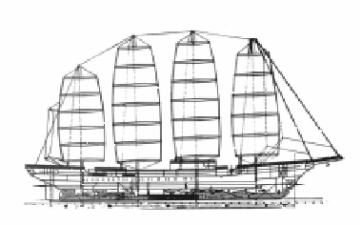
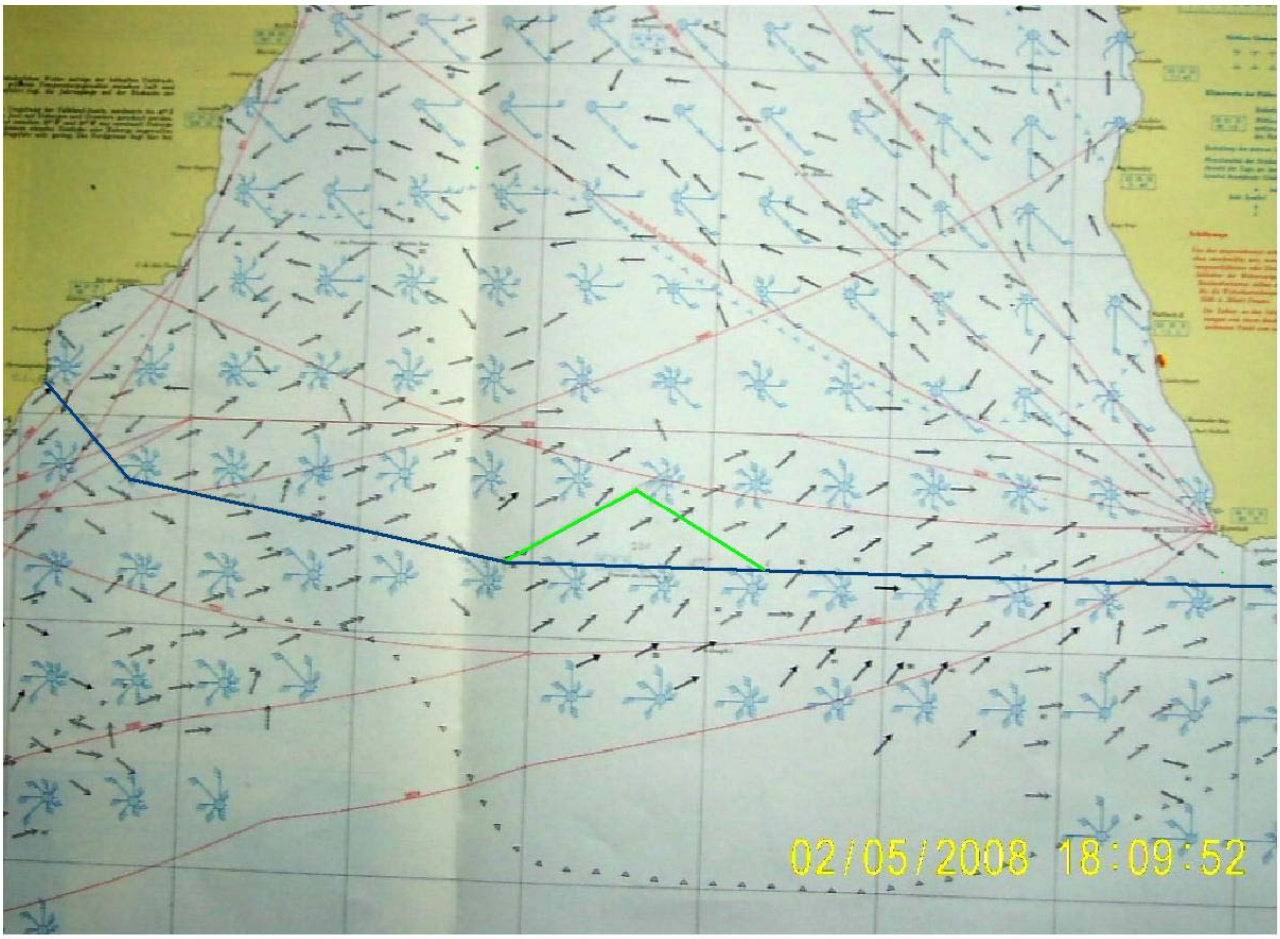


This here is a monthly chart of the south Atlantic in the month of June. We accept the most shown wind directions and their wind forces. We add the current shown by a big black arrow.



Leaving Tubarao I sail south-east to reach the roaring forties. After 24 hours I reach the first way-point for changing the course.
This is based on half wind, Bft. 5 = Sailing speed of 16,2 Knts. Resulting a day's run of 388,8 nautical miles.
Now, in the roaring forties we sail easterly and we will get more favorable and stronger winds. The average is around 6 to 7 Bft.

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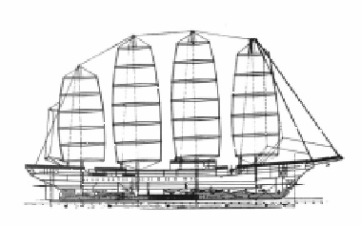
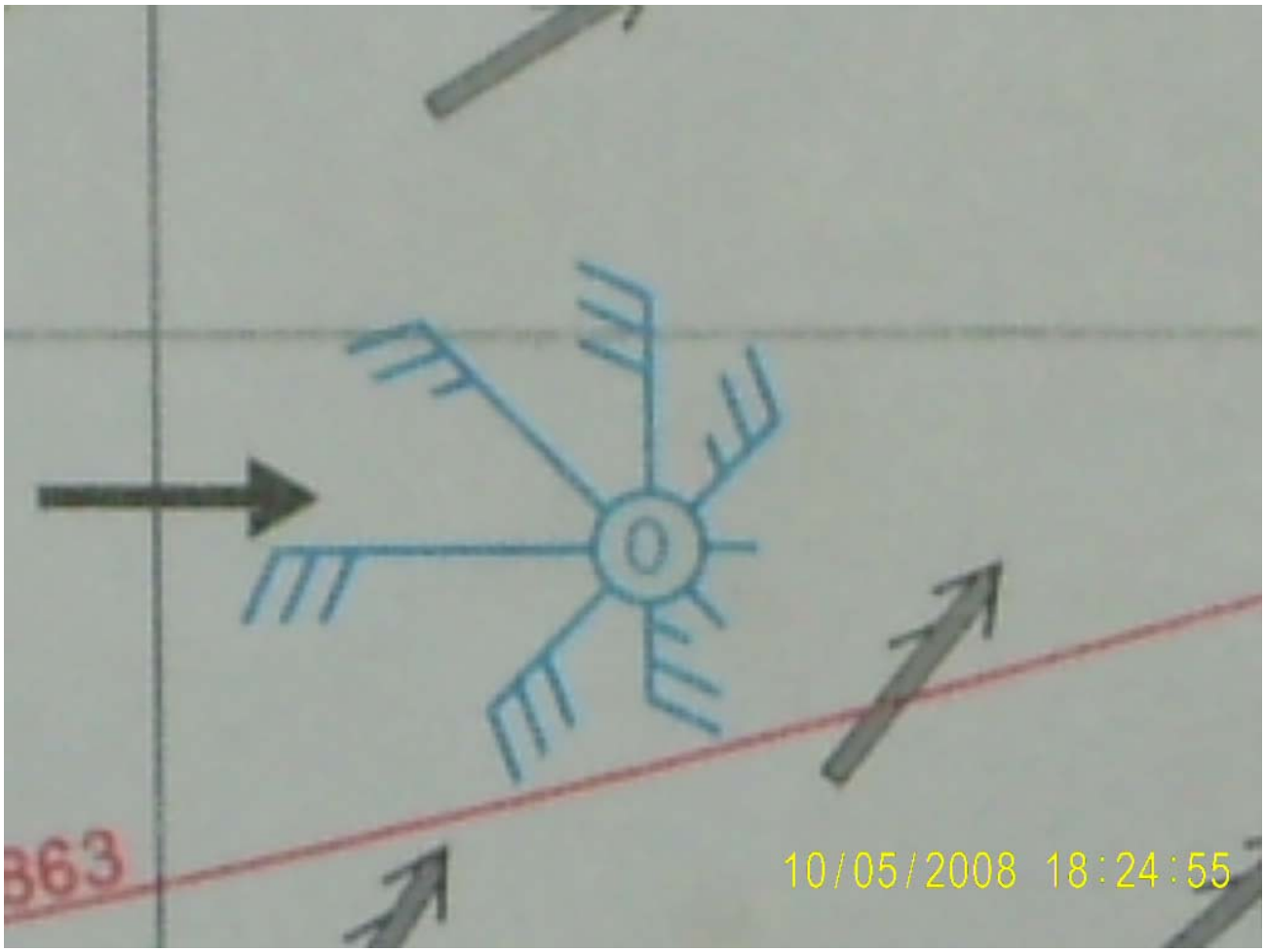


The probability of gales and stormy weather is by 20%. So we should add wind capacities. Here are the details of what I call a windrose:



We also should not forget the current of the surface (big black arrow) carrying us with 20 to 30 nautical miles per day in our direction.

To sail with an average speed of 18 Kts is very realistic and done by an old-timer, the “Preussen”, at the beginning of the last century. Not to forget that we have a modern sailing vessel of much more sailing efficiency and a finer hull.

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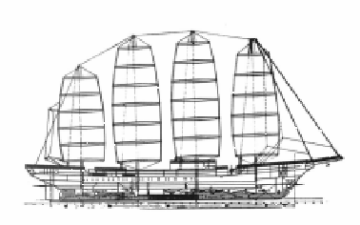
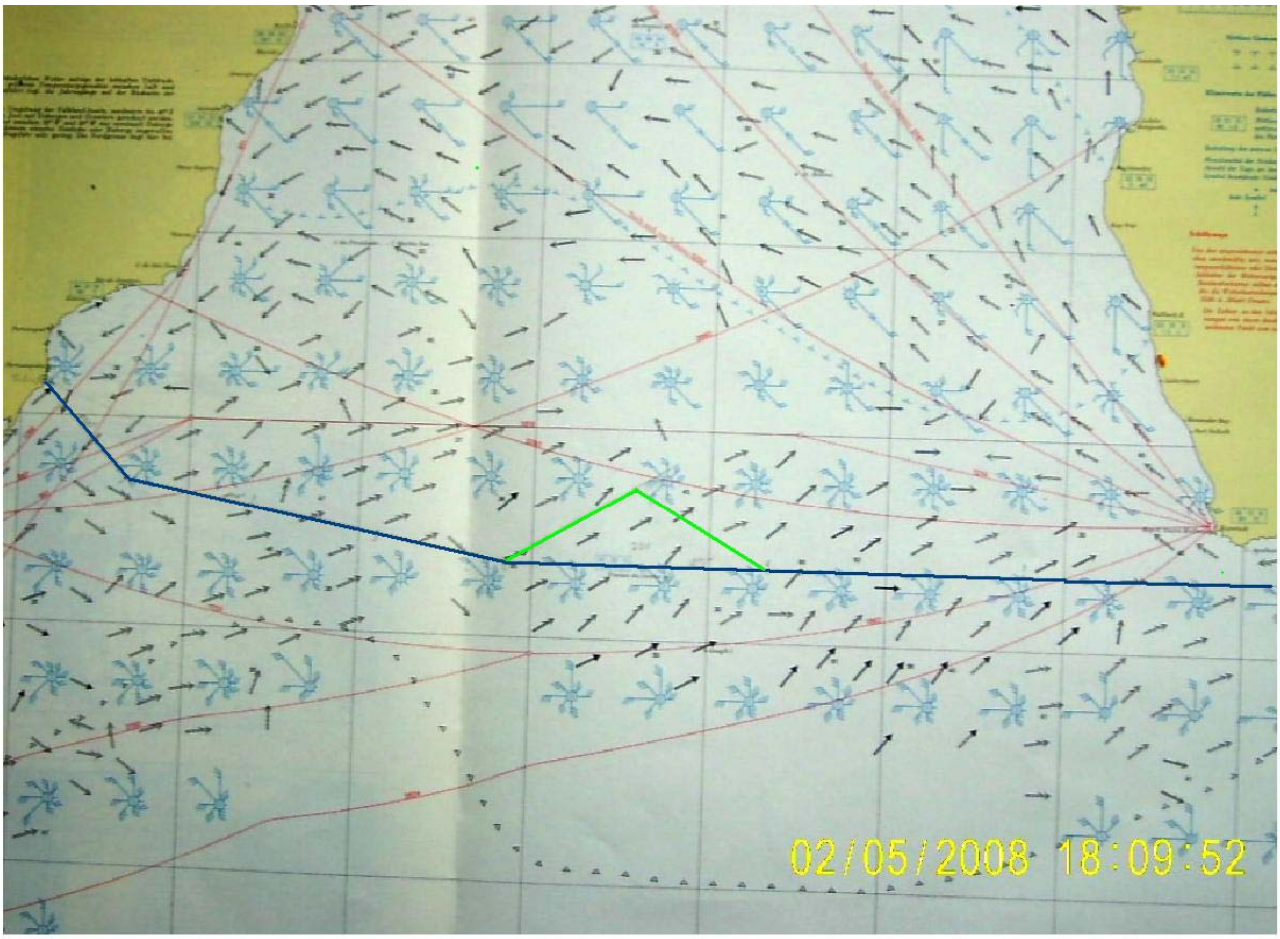


18 Kts. means a day's run of 432 nautical miles and including the current, the optimum will be around 450 nautical miles. An average of 18,75 Kts. – Not bad, faster than a motor ship and until now, no costs for bunker. – The wind is for free!

The green courses indicate the quartering of the wind. This makes the ship faster on the basic course then to sail straight down-wind.
But in realty we will sail by advice of the weather reports. These courses will make the ship even faster.



Under these conditions the sailing vessel reaches the southern part of Africa in 8 days!
In relationship to the motor driven vessel the sailing ship has made good more in distances in time.
The motor ship would reach this point in 10 days and 17 hours.

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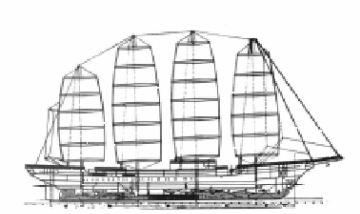
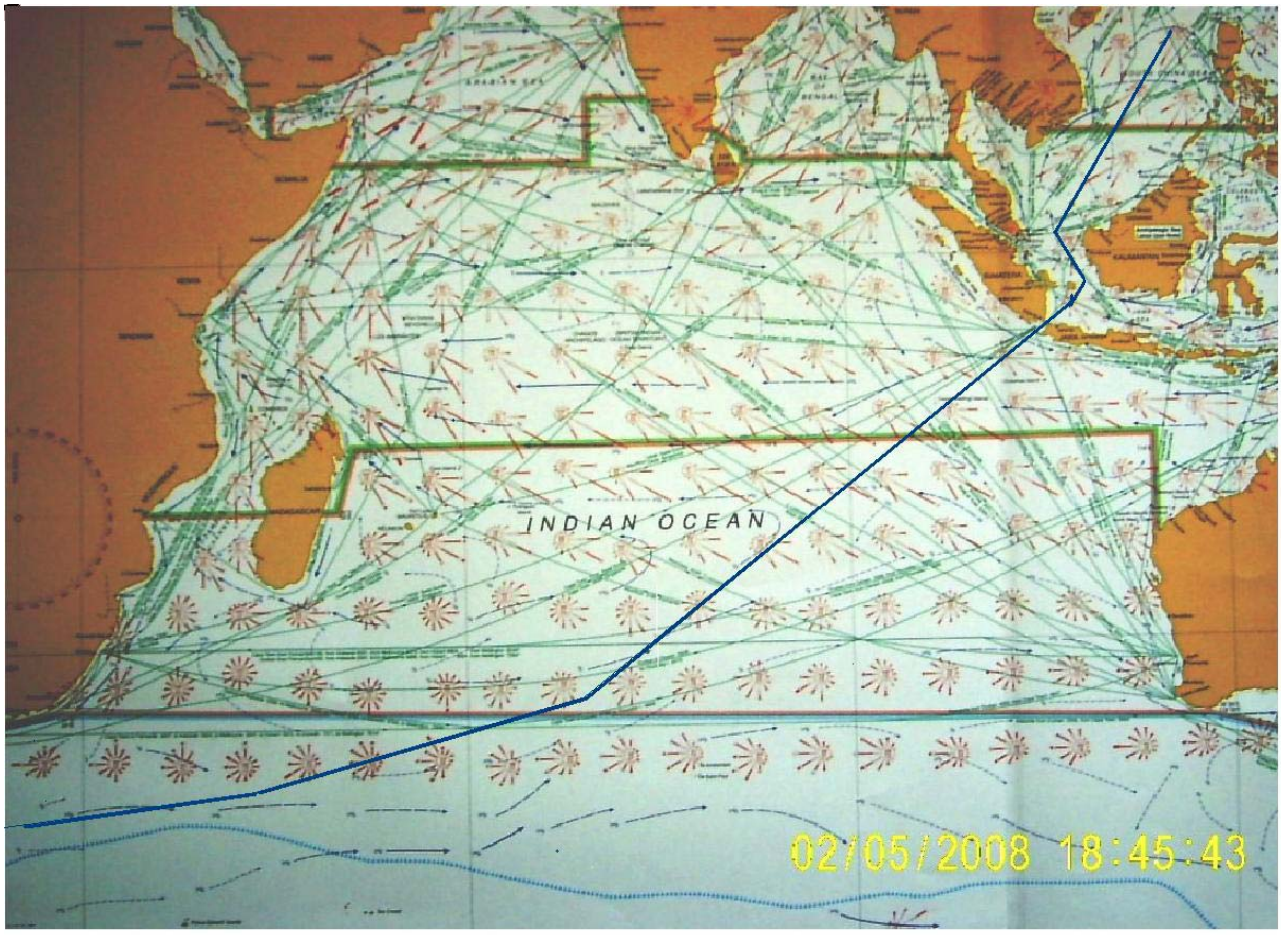


We can see in this map that we made 3.600 miles in 8 days,

- But noteworthy not a Cent was needed for propulsion or any other kind of energy.

- And the sailing vessel was 65 hours faster and economized a lot of money.

In the Indian Ocean the wind conditions are not as well, but they are favorable enough to keep the advantage.
In the summertime I will sail from the 40° longitude east lightly more in northern direction and will intensify this trend up from the 70° clearly.



We set a straight course for the Sunda Strait.

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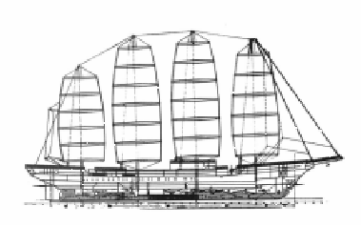

Steering this course we will have good winds of 5 – 6 Bft. Enabling the ship to a sailing speed of about 15 Kts.

After the passage of the Sunda Strait we will get lower winds.

But in the months of June, July and August, the times of the south Monsoon, there is still force enough to give us a speed of 10 – 12 Kts.

Let us calculate with the medium, saying 11 Kts.

Looking to the different sea areas, I realize the following dates:

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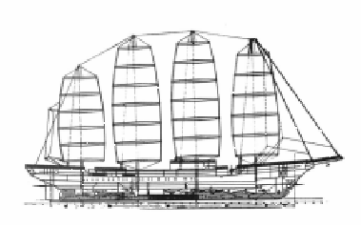

- South Atlantic	3.600 Nm.	18, 75 Kts	= 8 days
- Indian Ocean	5.400 Nm.	15, 00 Kts	= 15 days
- Chinese Seas	2422 Nm.	11, 00 Kts	= 9 days and 4 hours
		Total	= 32 days and 4 hours

Consumption of bunker = 0

Maybe I haven't carried the exactly same quantity of ore. Maybe a little less.
But I reached the goal and it didn't cost me any cent for propulsion. And there was no pollution by exhaust.

Nevertheless – and this is often forgotten, each liter of fuel produces 17 m³ of exhaust.
We saved – merely on the voyage from Brazil to China about 20 million m³ of exhaust!
And not to forget the bunker is not charged wit 10 ppm (parts per million) Sulfur, but with 27.000 ppm.

In times of variable winds or in times of the north east monsoon, November – March the situation in the Chinese waters is much more unfavorable for sailing vessels.

There are two alternatives in my opinion:

1. Furl the sails and going with motor power for the rest of the way. Now it costs money, but this will be only a part of the total sum. Nevertheless I sailed the last 23 days and saved a lot of money.

Or

2. Not going through the Sunda Street but sailing with the favorable winds from southwest or west or northwest of 5 or 6 Bft. giving us about 15 Knts. eastwards and taking northern courses after having passed Timor.
   Than we can sail north with about 10 Knts.

   Taking this route there are about 2.000 Nm. more to sail and I will than need 15 days instead of 9 days to reach my destination.
   But I think, it is better sometimes to spend more time, but save money.
   There is no hurry for ore.

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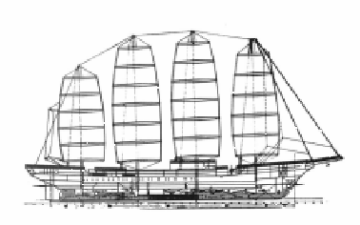

I would prefer alternative 2.

Summing up:

If it was the target to transport goods reasonably priced, without pollution and with reliability to their destination port, I would say: This is done.

Because ore, coal and grain are not under time pressure and the possibilities of communication are better and better and allow the permanent contact between Charterer and ships, the due date of loading or unloading can be corrected continuously without any problem.

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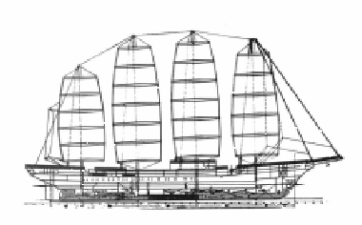

The way back to the loading port with an empty ship is (Because there is probably no cargo in China), as mentioned before, of great importance.

For motor ships it is very expensive.

Sailing ships sail down southward on the east coast of Australia. Reach the strong west wind and sail with the winds around Cape Horn and north to Tubarao.
A future meteorological advice to these sailing ships will be as normal as actually navigation help in a car. The program therefore is ready.

The international trade will change due the world wide conditions. This is inevitable!

The analysis of the shipping market shows that there is a leek of Bulker.
I hope that I have shown that sailing vessels should have and will have their place in the world wide trade. They are needed due to fuel pricing, dramatic change of climate and the fact of coming peak oil.

My figures showed a singular example and showed it in an optimistic way. But still reducing my figures by 10% or 20% it is it worth.

For sailing vessels the most important facts are:
- Only used in between the permanent wind systems. There are many.
- Restricted in cargo like bulk or liquids. – No container.
- They don't need more crew.
- No man to climb the mast except for maintenance or repairs.
- Going close to the wind.
- Automatically setting and furling of sails.
- On some routes faster than motor ships.

Thank you for your attention

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