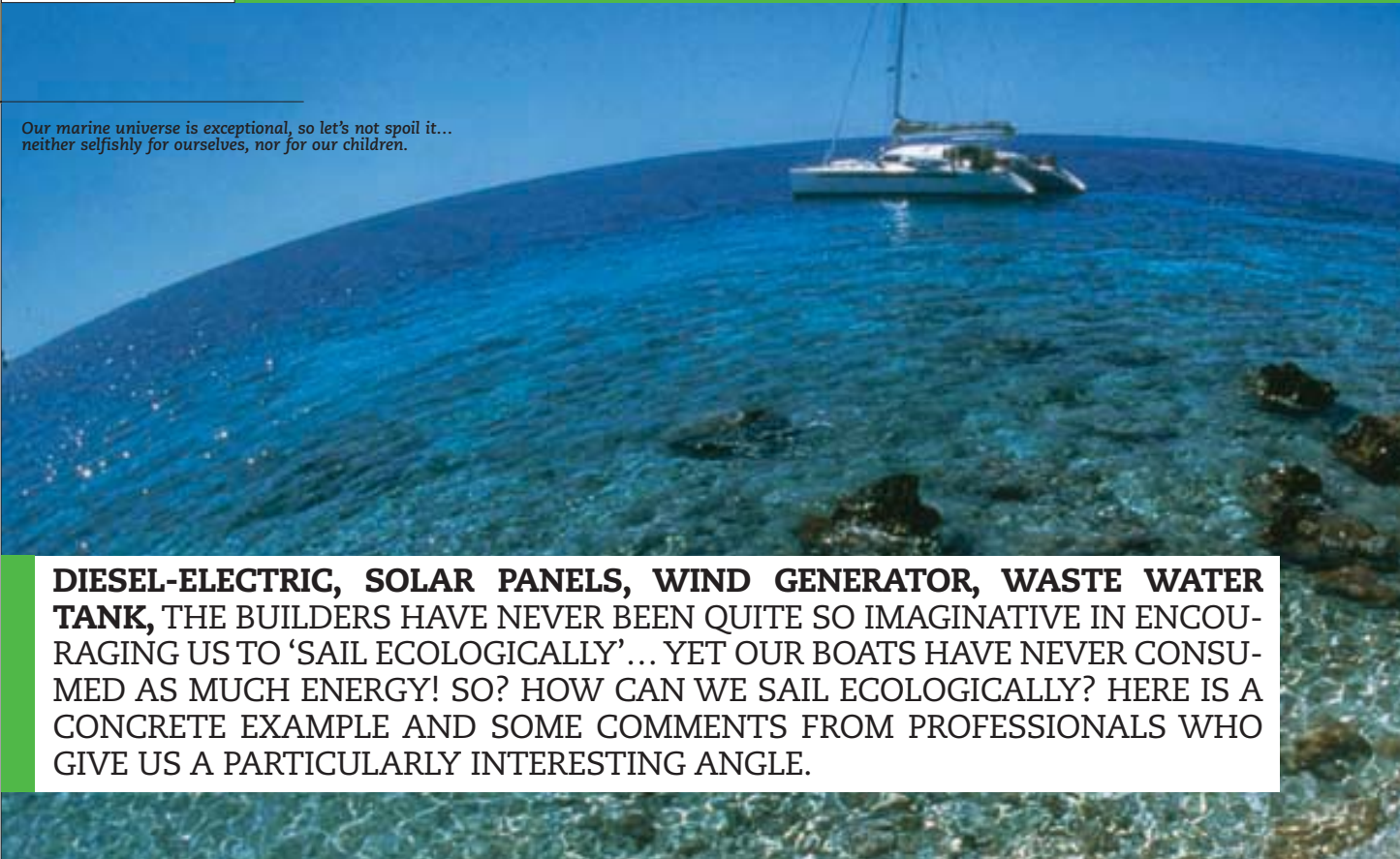


*Our marine universe is exceptional, so let's not spoil it... neither selfishly for ourselves, nor for our children.*



**DIESEL-ELECTRIC, SOLAR PANELS, WIND GENERATOR, WASTE WATER TANK,** THE BUILDERS HAVE NEVER BEEN QUITE SO IMAGINATIVE IN ENCOURAGING US TO 'SAIL ECOLOGICALLY'... YET OUR BOATS HAVE NEVER CONSUMED AS MUCH ENERGY! SO? HOW CAN WE SAIL ECOLOGICALLY? HERE IS A CONCRETE EXAMPLE AND SOME COMMENTS FROM PROFESSIONALS WHO GIVE US A PARTICULARLY INTERESTING ANGLE.

# Sailing ecologically: dream or reality ?

## Fernand's challenge.

When the inventor from the Auvergne region of France, Fernand Forest registered the patent for the internal combustion engine in 1885 and applied it to the motor launch (1888), he couldn't have guessed at the consequences his discoveries would have for the 21st century. The way in which this genius was treated (he held 135 of the 156 patents at the first 'Salon de l'Auto' in Paris in 1901 and remained poor all his life) is already a subject for meditation... The rise of a visionary and iconoclastic technology in the middle of a steam-dominated culture is another! A century later, we all use the land or water-based applications that this bright spirit gave us, without remembering his fundamental message! The change in the composition of our precious atmosphere, the increase in world population, the civil and military

nuclear industries, the geo-strategic rivalries which follow, all impose an awareness which should make us to face up to ourselves and allow ourselves to take the big step towards decentralised energy solutions, clean technologies and relaxation of international relations. Ferdinand! Help!

## Climate change and climate for change

Leisure sailing is symbolic of the use of the resources of the wind and the sun. Sailors, architects and technicians are therefore bearers of this inheritance and are responsible for discovering new compromises acceptable to nature. We wanted to bring our editorial contribution to something which is really beyond all of us. Multihulls World has chosen to put forward projects which are structuring and exemplary, whilst posing the question,

"what is sailing ecologically?" to a certain number of players in the multihull leisure sailing world. The first answers are published in full, others will follow and will enrich the "permanent competition for ideas and architecture" to which we are opening these columns.

## Sailing ecologically: what is it?

Although we use the force of the wind to make our boats move, we also use more and more the 'iron topsail' to produce the energy we are more and more fond of aboard. Two, three, even four hours' engine a day are thus necessary on our modern multihulls, to produce the electricity for the computers, cold for the fridge and the freezer, not to mention the watermaker... Comfort equipment which has become completely essential aboard! Let's not mention the inflation in the number of bat-

teries (whose recycling poses a real problem), the manufacture of solar panels, which requires a considerable amount of energy, or the manufacture of the hulls, whose main ingredient remains...oil!

So, how can we 'sail ecologically'? There are of course the concrete examples of Sébastien Roubinet and the crew of BABOUCHE, who recently completed the North-West Passage purely under sail. Dissident heir to Peter Blake or Jean-Louis Etienne, Sébastien opened a new route which is both concrete and symbolic at the

### Christophe HOUDET

project leader on the trimaran 'l'Idéc', racer, builder).

Hello, Sailing ecologically? I think that Alain Guillard with his windsurfer dugout has lots of lessons to teach us. Bon courage



A catamaran in the ice...



The melting of the ice pack is posing a real problem in society.

same time. His feat was modern and respectful of the environment (small boat, strong, long-lasting, fun and fast), representative of a new approach to scientific or sporting adventure and forms a fantastic basis for reflection on the new relationship to be established between man and nature. There is also Francis Joyon, who is setting off to attack the round-the-world record with no engine aboard his trimaran, sending a strong signal to the ocean racing world. These

exceptional and talented sailors are opening the way in their own manner, but we can take inspiration from them. Sailing ecologically can also be simple: only have aboard the equipment which is really essential to your sailing, choose a light boat which accelerates in the slightest breath of air, equip it with, (and above all, use), waste water tanks, limit energy consumption (water, leds, insulation, ventilation...). "The thousand-mile journey begins with the first step!" (Rudyard Kipling).

## The example of largyalo and the ark of ideas project

### A 1,000-day world forum in 100 stopovers.

The Ark of Ideas project is not a nautical expedition, but the concerted action of an international multidisciplinary group in favour of the environment. This collective, made up of researchers, journalists, economists, communication professionals, mountaineers and sailors, has set itself the aim of travelling all over the planet to look for evidence from children, adults, scholars and philistines about the citizens' expectations, concerning peaceful globalisation, respecting both nature and mankind. LARGYALO's humanistic voyage is spurred on by the urgency of the change in the atmosphere and its climatic consequences. It wants to go further than the quick morning's lobbying concerning nuclear power or agro-fuels... and give modern means to the expression of participative democracy in this area (Web 2, Ark TV Channel, blogs, combined actions with the big world associations...). 12 large-scale conferences are planned on all the continents, to report on this abundance of non-conventional ideas.

### LARGYALO

The expression Largyalo in Tibetan, means 'may the gods be victorious'; it is a call of the Ladakhi and Tibetans after achieving a difficult task, such as, for example overcoming one of the high passes. This memory of Himalayan expeditions has become the 'Ark of Ideas' crew's warcry, and by extension, the name of their faithful catamaran.

### Exemplary construction.

To be virtuous from an ecological point of view, a boat must be strong, light, long-lasting and for the major part, created from renewable resources. Recycling has become an 'economic subject', but that must not justify the

'throw-away' character of the objects we use. The crew of LARGYALO is conscious of this first pitfall and has chosen wood/epoxy to minimise the carbon impact of the project; the quality of construction pushes back the limits of its use. The 25,000 hours invested in this creation show the strength of the collective commitment.



### DENIS KERGMARD

(naval architect, builder):

The sailing world is historically (technically, socially, politically, philosophically, economically, sentimentally) linked to the use of wind energy. The sea is certainly the environment where the reality of renewable energies is the most obvious and accessible... As regards leisure sailing, it is surprising to note the expansion in the classic motor boat market and the poverty of proposals in terms of real technological adaptation in this market niche: mixed solar/wind propulsion, use of slim hulls in place of the energy-hungry wedge shapes, reduction of excessive displacement... That's not the half of it! The media can have a real place in this process, by proposing, for example, a big competition for ideas and architectural projects around this theme. Open to everyone, this competition would be the opportunity to put forward the reality and the immediate necessity to react in all areas of human activity, to save our planet.





Largyalo, the ecological catamaran ?



Inside Largyalo, all the equipment will soon be fitted for carrying out scientific studies.

“ Sailing ecologically is a wide concept meaning ‘sail transparently’, with no impact on the ecosystem... ”

**The platform’s legitimacy.**

The Largyalo 65’ is a utilitarian development of the Pahi 63’; it is heavier, more liveable, its cabin roofs are higher, corresponding to the requirements for an expedition boat. The timeless silhouette harmonises with the demands of a ‘tribal’, operational vessel, free from all western arro-

gance. Despite its ‘protohistoric’ lines, LARGYALO is a superb catamaran, designed for 16 crew members and with simple comfort.

**The Flexi Space concept**

LARGYALO must meet quite varied expectations, given its aim and its (relatively) small size (20m nevertheless): training ship, scientific platform,



**GUY DELAGE**

(ocean racer, adventurer, builder):

Sailing ecologically is a wide concept, which for me means ‘sailing transparently’, with no other impact on the ecosystem than that generated by any living being...

That of course implies numerous conditions which I am trying to respect in the DAGDA project (fast, 60’ expedition-charter monohull in strip planking) which is being realised at the moment. The line to follow consists of separating the fundamental from the useless in our daily maritime life...

The permanent contributions from racing, in terms of hydrodynamics, aerodynamics and structural modelling allow us to create ‘intelligent’ boats which are therefore high-performance as they convert wind energy into driving force whilst using less materials, and all this with no effect on safety – on the contrary!

The real performance, therefore the intelligence of the creation is indissociable from the concept of ecological sailing. This is what avoids absurd wastages both during the construction and the operation...

To sail ecologically is not to sail like they did two, three or four centuries ago aboard antediluvian craft which needed lots of energy of all sorts to move slowly, whilst living as they did ashore.

To sail ecologically is to choose to use in the best possible way the potential of what nature can renew, and not to plough through the sea... It is just skimming the surface, sliding infinitely and leaving no wake!

There remain unresolved problem areas, such as those of the numerous oil-derived chemical products which help us to build reliable boats (resins, fibres, mastics, all kinds of covering...). But the general public is becoming more and more aware and I would bet that in less than ten years, we will have natural substitute materials!

I would like to take advantage of your columns to rebel against the hijacking of the image of the big yacht races which use the ‘green’ side of sailing, whilst they shamelessly authorise fossil fuels to supply the sailing boats’ equipment. The technologies and the products exist to put this right and make the big yacht races clean again (as they were in the 70s). In addition, the CO2 emissions collateral to these events (transport, etc...) are abusive and rarely quantified. Would it be stupid to ask that all sporting events be taxed to finance carbon compensation equivalent to their production?

I ask you to help to put pressure on the main players - sponsors, racers and organisers - to end this unacceptable deception!!



Part of the "team Largyalo"...

reception base, video studio, press conference office and in addition, ocean-going catamaran! James Wharram's 'Flexi Space' concept corresponds perfectly to this requirement for versatility. All the cabins are adjustable to requirements. The general atmosphere of these convertible spaces evokes Feng Shui and contributes to the convivial atmosphere aboard.

### The energy concept

LARGYALO is not a travelling catalogue

“ Pleasure sailing is symbolic of the use of the resources of the wind and the sun... ”

of all the virtuous solutions available, but must be credible in this sensitive area. A lot of work has been carried out

on the reduction of electricity consumption (led bulbs, reasonable comfort, network quality...); the aim of

self-sufficiency through solar and wind-derived supply will easily be reached, to realise the demonstration. For this, 30m<sup>2</sup> of solar panels will be fixed on the cabin roofs, as well as 2 high-performance wind generators on the masts. The electric outboard motors – co-generators will also supply electricity whilst sailing. Storage will be optimised by a bank of lithium-polymer batteries (3-fold reduction in weight for the same capacity). Finally, a small generator running on vegetable oil will be carried for emergencies.

### Sailing aboard LARGYALO

The aim of the summer 2007 test campaign in the Mediterranean was to test the platform, its rig and the accommodation, before the fitting of the definitive on-board technical equipment, which has been developed along with European firms (batteries, motors, wind generators, solar panels...). Several cruises, to Corsica and the Balearics have allowed the team to test the boat, as well as its 'charisma' in the harbours. I was able to slip aboard for 2 days.

### A mini-village on the water

The first impression concerns the amazing operational area of the deck. This



### Erik LEROUGE

The real definition of ecology is the ecological footprint. We must therefore sail leaving the smallest possible signature on the environment and that goes from the manufacture of the materials, via transport, to the use of the boat. Nothing to do with the sustainable development which is just to impress us and is intended to ease our consciences whilst developing juicy new green-coloured markets.

The idea closest to my heart is to sail completely self-sufficiently with no fossil energy, diesel, gas... It is technically possible and I am progressing in this area with aware clients; I also have a personal project.

The first essential is a good sailing boat which sails well in light weather, not a caravan which needs the engine up to force 3, or to go to windward. Then we must learn to carry out all possible manoeuvres under sail, and only use the engine when we cannot do otherwise. I am confident about this point, because, as opposed to the car, our means of transport is ideal for using the wind; the inescapable acceleration in the rarity and cost of fuel will soon sort out the big engine enthusiasts! The electric motor is just an auxiliary, there is absolutely no point in looking for a good range; we don't have suitable batteries. We have sails for that!

We must use all the complementary means of generating on-board energy: wind generator, hydro-alternator, solar panels. We can provide the on-board electricity, limited propulsion, the cooking, I hope and perhaps the

heating. But first we must limit energy consumption: leds, insulation instead of heating, ventilation instead of air-conditioning, a well-designed, top-loading fridge. At the end of the day, a simple boat is much more pleasant to live aboard, as it demands less maintenance and causes fewer problems when cruising.

We must learn to moderate our ambitions; the ecological footprint of a boat increases in proportion to the cube of its size. Finding materials and manufacturing processes with the smallest ecological footprint is extremely complex, because:

We must encourage durability. There is no point in having renewable materials if we have to rebuild the boat every 20 years, or if they require a lot of maintenance to prevent them deteriorating in the marine environment. Remember that under Louis XIV, France had fewer forests than nowadays, thanks to shipbuilding and domestic use. At the moment, one of the major problems with global warming is deforestation.

The ecological footprint is even smaller if the boat is light, durable and well insulated. This pleads in favour of a modern construc-

tion based on the sandwich.

But with which basic materials?

Wood for the skins? Perhaps, if the forests are correctly exploited. The quantity required is less than for traditional constructions. In any case, this requires epoxy resin.

I am very interested in the use of natural fibres, notably linen. But the fibre must be cultivated organically, using no pesticides; otherwise it's the same rip-off as green fuel, which is contributing to the intensive agriculture disaster.

New, more 'natural' resins will have to be found. We are working on it. We know how to work cleanly using infusion or pre-impregnated, all that remains is the problem of the core. The foam production process is highly polluting. The manufacturers are working on this problem.

Balsa could be envisaged, but is far from being ideal, and the same reservations apply concerning forest exploitation.

In short, the real challenge will be the availability of less polluting materials which preserve the essential characteristics – lightness, insulation, absence of maintenance and durability.





Fighting against global warming is now essential, so we can continue seeing such sights.

**FICHE TECHNIQUE LARGYALO**

<b>Architect:</b> James Wharram, Hanneke Boon
<b>Builder:</b> Team Largyalo
<b>Length:</b> 19.95m
<b>Beam:</b> 10m
<b>Freeboard:</b> 0.95m
<b>Draft:</b> 0.95/1.75m
<b>Weight:</b> 15t
<b>Deck area:</b> 150m <sup>2</sup>
<b>Height of the 2 masts:</b> 16.10m
<b>Windward sail area:</b> 133m <sup>2</sup>
<b>Fresh water:</b> 400 litres
<b>Waste water:</b> 200 litres
<b>Berths:</b> 16
<b>Toilet/showers:</b> 4
<b>Refrigerator:</b> 340 litres
<b>Freezer:</b> 90 litres
<b>Cooker:</b> induction
<b>Engines:</b> electric, 2 x 10kW/220V + 1 x 10kW as a bow thruster
<b>Watermaker:</b> 120 l/h
<b>Solar panel area:</b> 16m <sup>2</sup> on the cabin roofs, 12m <sup>2</sup> mobile, 15m <sup>2</sup> in the rig.
<b>Wind generators:</b> 2 x 600w
<b>Batteries:</b> lithium/polymer, 3800Ah, 3000 cycles (320 kg)

**Materials used**

- 600m<sup>2</sup> of marine plywood
- 12m<sup>3</sup> of solid wood
- 1.5t of epoxy resin
- 1 000m<sup>2</sup> of glass fibre
- 150l of paint
- 1,500m of rope
- 600m of cable
- 25,000h work

Follow the ARK OF IDEAS project on : [www.thearkofideas.org](http://www.thearkofideas.org)  
[www.largyalo.de](http://www.largyalo.de)

floating 'village' has its central square, its gazebo and its patio, and you can easily imagine 40 people participating (at anchor) in a projection, a debate or...a barbecue. The '2 houses'(the crew call the cabin roofs 'houses') accommodate the steering position and the chart table, the skipper's cabin, a 10-person saloon and a galley. The crew cabins and heads are in the hulls, accessible through individual deck hatches (to be closed after use in the case of a wet cruise!) and thus allow judicious combinations of privacy and social life. The atmosphere in the

cabins is splendid, just like the exceptional quality of the finishing aboard the boat...

**Useful cruising**

This catamaran is an invitation to travel; it communicates a remarkable peace of mind and predisposes you to study, observation and exchanges. Manoeuvres (there are not many of them) are carried out by hand; the deck plan is almost as bare as in the old sailing ships! The block and tackle and elbow grease here replace the 55ST... Using the 2 gaff mainsails proved sim-

ple and economical; everything is repairable using the means carried aboard. LARGYALO is a swing keel boat with a shallow draft; it can go anywhere and be beached easily. The engines are two 10KW electric outboards (2 x 50hp 2-strokes during our test) on floating brackets.

LARGYALO will be slower than the Pahi 63' from which it is derived; half laden we sailed at between 8 and 13 knots (slowed by towing a big dinghy) but the boat will be able to cover 160 to 200 miles a day on ocean crossings...quite calmly!

**Call for participants**  
What does sailing ecologically mean to you?

Call for participants  
What does sailing ecologically mean to you?  
We await your reactions; a regular column will publish the contributions.

Competition for architecture and ideas applicable to ecological sailing in multi-hulls.  
Please send projects, reports on prototypes, simple or brilliant ideas from your creative brains, or meetings whilst sailing, to the editor.

**3**  
examples  
of provisional  
electrical  
evaluation  
for  
LARGYALO

**1 : Day sailing from anchorage to anchorage:**

**Consumption:**  
On-board comfort (galley, watermaker, lighting, electronics...): 6,170wh  
Windlass, electric motors: 1,300wh  
Total 7,470wh (622Ah at 12V)

**Production:**  
Solar: 5,796wh  
Wind: 4,300wh  
Hydraulic generation: 2,724wh  
Total : 12,840wh (1,070Ah at 12V)  
Giving a surplus of 6,400wh (533 Ah)

**2 : Two days at anchor:**

**Consumption, 2 days**  
On-board comfort: 12,000wh  
Windlass, electric motors: 1,300wh  
Anchor lights: 580wh  
Total: 13,880wh (1,156Ah at 12V)

**Production :**  
Solar 1st day: 15,396wh  
Solar 2nd day 10%: 1,536wh  
Wind 1st day 25%: 1,080wh  
Wind 2nd day: 4,320wh  
Total: 22,332wh (1,861Ah)  
Giving a surplus of 4,226wh (352Ah at 12V)

**3 : Ocean cruising**

**Consumption per day**  
On-board comfort: 6,000wh  
Peripherals, day: 170wh  
Peripherals, night: 945wh  
Total: 7,115wh (593Ah)

**Production :**  
Solar 25% : 1,440wh  
Wind: 4,320wh  
Hydraulic generation: 9,360wh  
Total: 15,120wh (1,260Ah)  
Giving a surplus of 8,005wh (667Ah).

## The month's good 'econautical' ideas

### Photovoltaic paint

A group of American 'startup' companies (Nanosolar, Nanosys and Konarka) in association with Matsushita and ST Microelectronics is perfecting a nano technology-based paint with the aim of realising photovoltaic coverings. If these active paints are harmless enough to be allowed on the market (yet to be proved), the whole of a boat's or a building's surfaces could behave like a solar panel.

### Francis joyon attacks a clean round-the-world record

Sir Francis will start a clean record attempt aboard the Irens-Cabaret designed maxi trimaran; this double event deserves to be acknowledged and followed. Exit the 37hp engine and the hundreds of litres of diesel necessary for its operation. Francis is only taking solar panels, wind generators and a fuel cell. [www.trimaran-idec.com](http://www.trimaran-idec.com)

### Transat and fuel cell

Olivier Cusin aboard "Energies autour du monde" is testing a new fuel cell during the Transat 6.50. <http://energiesautourdumonde.fr> and [www.cervin-enr.com](http://www.cervin-enr.com)

### Around the world in a solar-powered boat:

[www.planetsolar.org](http://www.planetsolar.org)

### Discussion forum touching on these themes:

<http://nouvellesociete.free.fr>

**Bruno FERHENBACH**  
(architect, racer, organiser of 'solar future')

Roughly, I think that leisure sailing and lasting development are not compatible... We can minimise the impact, but it will remain negative. Buy second-hand boats, with no engine...



Sailing ecologically can be as simple as using a waste water tank, and solar panels...



...and a wind generator to produce your energy!

### Advice for replacing toxic cleaners

(source [www.echo-mer.com](http://www.echo-mer.com))

Fibreglass	Solution of bicarbonate of soda and salt
Aluminium	1 good soup spoonful of anti-scaling cream in half a litre of hot water
Brass	Solution of Worcester sauce, vinegar and salt
Chrome	Solution of vinegar and salt
Copper	Solution of lemon juice and salt
Cleaning the deck	1 cup of vinegar in 8 cups of water
Washing your hair	Baby shampoo (no phosphates and balanced ph)
Cleaning your hands	Baby oil or margarine
Transparent plastic	1 cup of vinegar in 2 cups of water
Removing mould	Solution of vinegar and salt
Cleaning the shower	Wet the surface, apply bicarbonate of soda and wipe.
Cleaning the toilet	Bicarbonate of soda
Cleaning the windows	1 cup of vinegar in two cups of water
Polishing wood	Olive oil
Polishing chrome/metal	Baby oil
Whitener	Hydrogen peroxide
Scouring	Bicarbonate of soda

### Philippe RIVIERE (architect)

The LARGYALO project is very interesting, but from my point of view, the fact that it is a sailing boat makes the demonstration less brilliant.

A lot of technology to do what Magellan and others did...

Going round the world with stopovers aboard a motor boat would seem to me to be a better demonstration of ecological cruising.

But the real problem (the most difficult to

solve) concerns construction as a whole. The most attractive material would seem to be wood, of course, but most of the wood used has exotic origins which necessitate lots of transport before being used in our countries.

Then there are the resins, the glues, the tissues, paints and antifoulings...the same goes for the sails, the running rigging... 'Modern' materials are far from being recyclable and ecological.

There is still an enormous amount to be done...