



SuperYacht

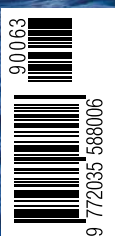


international

CANTIERE DELLE MARCHE **MIMI LA SARDINE**  
AZIMUT YACHTS **GRANDE 32 METRI**  
BAGLIETTO **SILVER FOX**  
RIVA **110' DOLCEVITA**  
CCN **FREEDOM 28M**  
PERSHING **8X**



DESIGN: **INFINITY BY ROSSINAVI**  
SHIPYARDS: **CODECASA SHIPYARD – SANLORENZO SUPERYACHT**  
**LYNX YACHTS – FERRETTI SUPERYACHT YARD**  
MEETING: **MONACO YACHT SHOW 2019**  
TECHNICAL: **SUPERYACHT WHIT WINGS**







# SUPERYACHT WITH WINGS

TECHNICAL

## BALTIC 142 AND DSS

by Andrea Mancini



By now it is a known fact: the deployment of foils, hydro-foils or immersed wings is currently revolutionizing the sailing yachts' world and more generally small sailing craft as well. We're not just talking about foils that allow boats to rise off the water and to 'fly', much in the same way as competition models taking part in America's Cup races and more. We're talking about those foils that are 'hidden' below the water and change performance notably while avoiding the dangers related to 'flying'!

We're referring to Dynamic Stability System (DSS) a device constituted by a lateral immersed foil which extends out of the yacht's hull on the downwind side thereby generating lift which will keep the boat more upright. This translates into greater performance without having to resort to complicated canting keels which have been source of a whole series of problems and liquid ballast (Sea water) which is often pumped into the upwind tanks to help keep the boat as upright as possible with the least angle of heel specially when close hauling. Foils have long been tested for more than a decade (see box). Today foils are a consolidated reality in competitive racing events everywhere and DSS equipped boats take the lion's share!

DSS is not only deployed to race faster. A yacht which can sail upwind with less heel offers more all round comfort comprising less roll, dampened movement over waves

and to a lesser degree will also reduce pitch and will sail faster! In a nutshell it seems to be an ideal solution for every sailing boat whether cruiser, fast cruiser/ racer or thoroughbred racing boats. However the yachting world but more specifically the sailing one has always been very traditional when not conservative and slow in accepting change and innovative solutions and DSS has remained something deployed mostly in competitions and not even in all major international events!

That is up until the other day because this summer there's an over 40 metre sailing yacht equipped with DSS. It is a super technological Baltic 142' with a transversal 9 metre foil which runs typically horizontally across hull and reduces heel and increases performance in terms of speed by 20% according to the designers involved in the project. This translates into sailing up to 25 knots with 25 knots of wind, obviously though in adequate sea states. The improvement on the angle of heel is considerable when considering that on a close haul it is normal for a sailing yacht to sail at an angle in excess of 20° whereas the same boat on a close haul in the same sea state with DSS will sail with an angle of heel of just 9° which represents a substantial improvement in terms of comfort and speed.





*In the pictures below, Work in progress on the DSS foil container slip installed on board: notice the foil's access hatches.*

rently cruising and not only for the DSS. For more general information on this yacht please refer to the dedicated box.

As mentioned the aim is to sail faster and most of all more comfortably. To reach this difficult result, Farr Studio has been recruited to deliver the yacht's water lines and studio Micheletti and Partners for the project design work supported by Baltic Yachts' team with documented capacity, in depth know - how to take on complex challenges and to blend them with cutting edge technology in addition to DSS inventors: Hugh Welbourn and Gordon Kay.

We're looking at DSS's foil installed into the Baltic 142: It is built in carbon, it is nine metres long and weighs a ton approximately. When not in use the foil is retracted inside the hull which is also nine metres across. When deployed in a close haul it protrudes for 6.30 metres out of the hull downwind and just below the waterline to generate a lift effect equal to 40 tons and more. The foil represents about one third of the yacht's displacement which will sail more upright and be considerably faster. This way it will sail more vertically, and faster while weighing one third less!

Obviously shifting the foil from port side to starboard and vice versa from inside the hull has meant finding ways of shifting the foil in a way as not to damage it, nor the 'tracks' on which it travels. But equally important is the fact that the hull must not take on any water when shifting the immersed foil through the apertures on both sides and the whole installed plant must not interfere more than so much with the yacht's layout and exploitable volumes.

As for recovery and launching of the DSS's foil, this moves inside a specific watertight container on runners



#### BALTIC 142 AND DSS SYSTEM

Let's examine the Dynamic Stability System's features and how they affect the new 43 metre sailing superyacht from this renowned Finnish shipyard. This yacht is one of the most technologically advanced sailings yachts cur-

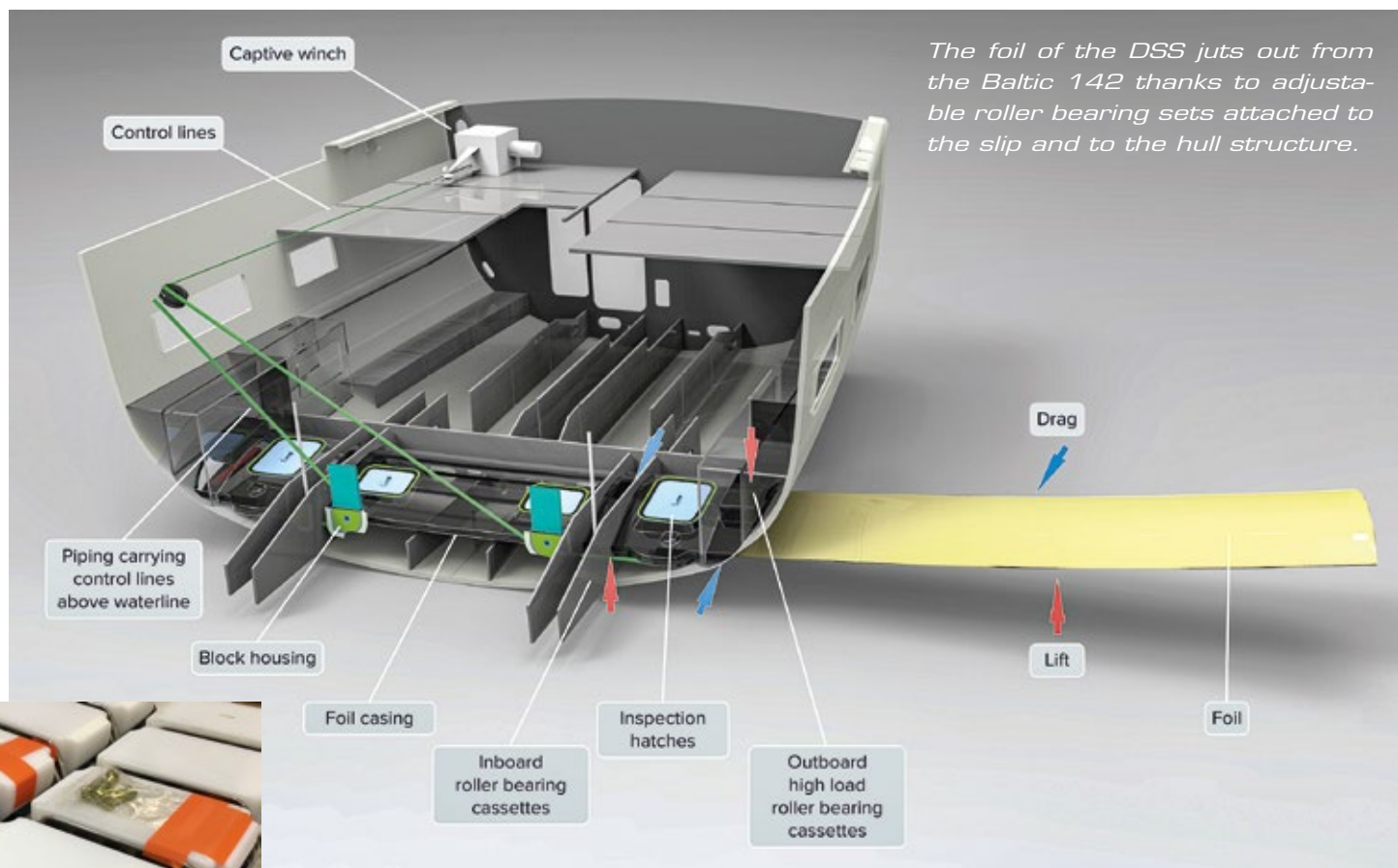
just below the waterline in much the same way as the seats in canoes do on rails. Obviously moving a nine metre foil with a potential load of 40 tons which weighs one ton is no child's play. In fact it took Ben Ainslie and his team from BAR Technologies over two and a half



# Superyacht with wings

## TECHNICAL

### Baltic 142 and DSS



years of experienced work on America's Cup boats under their belts to handle the matter of launching and recovering foils from the catamaran. The stern aperture for the foil was duly strengthened with titanium since it is considerably harder

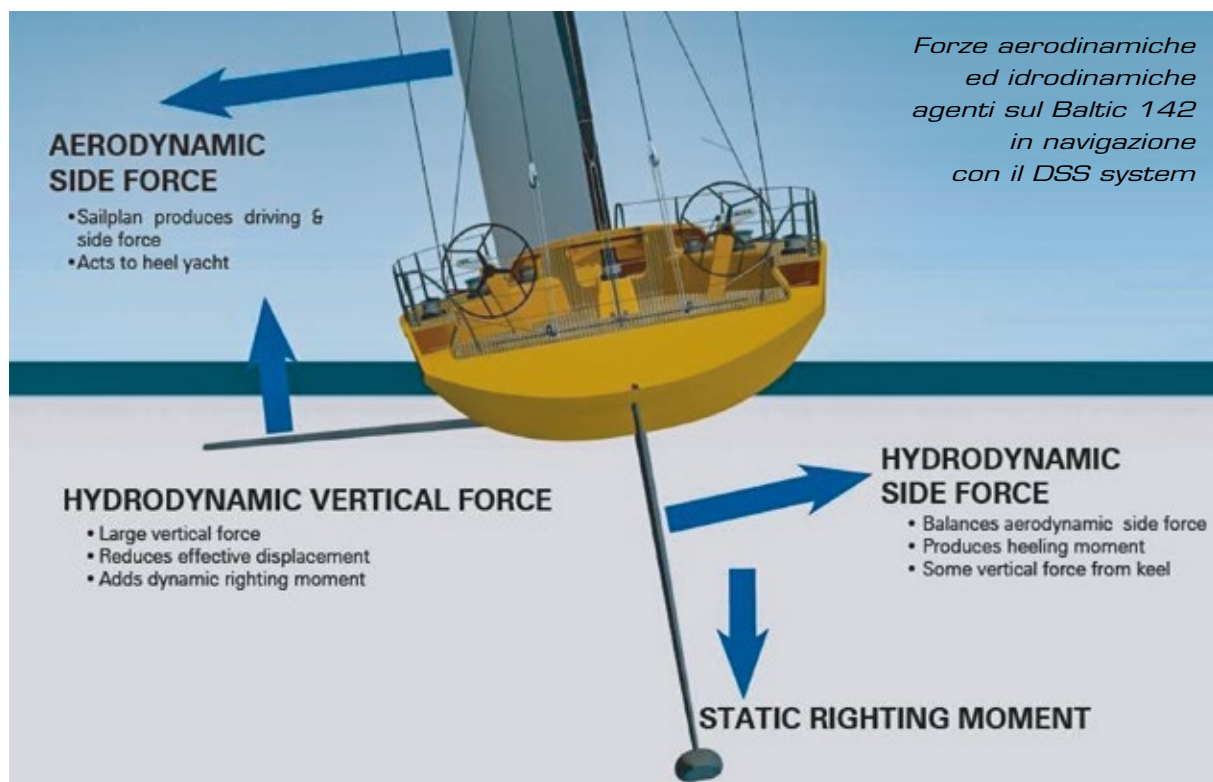
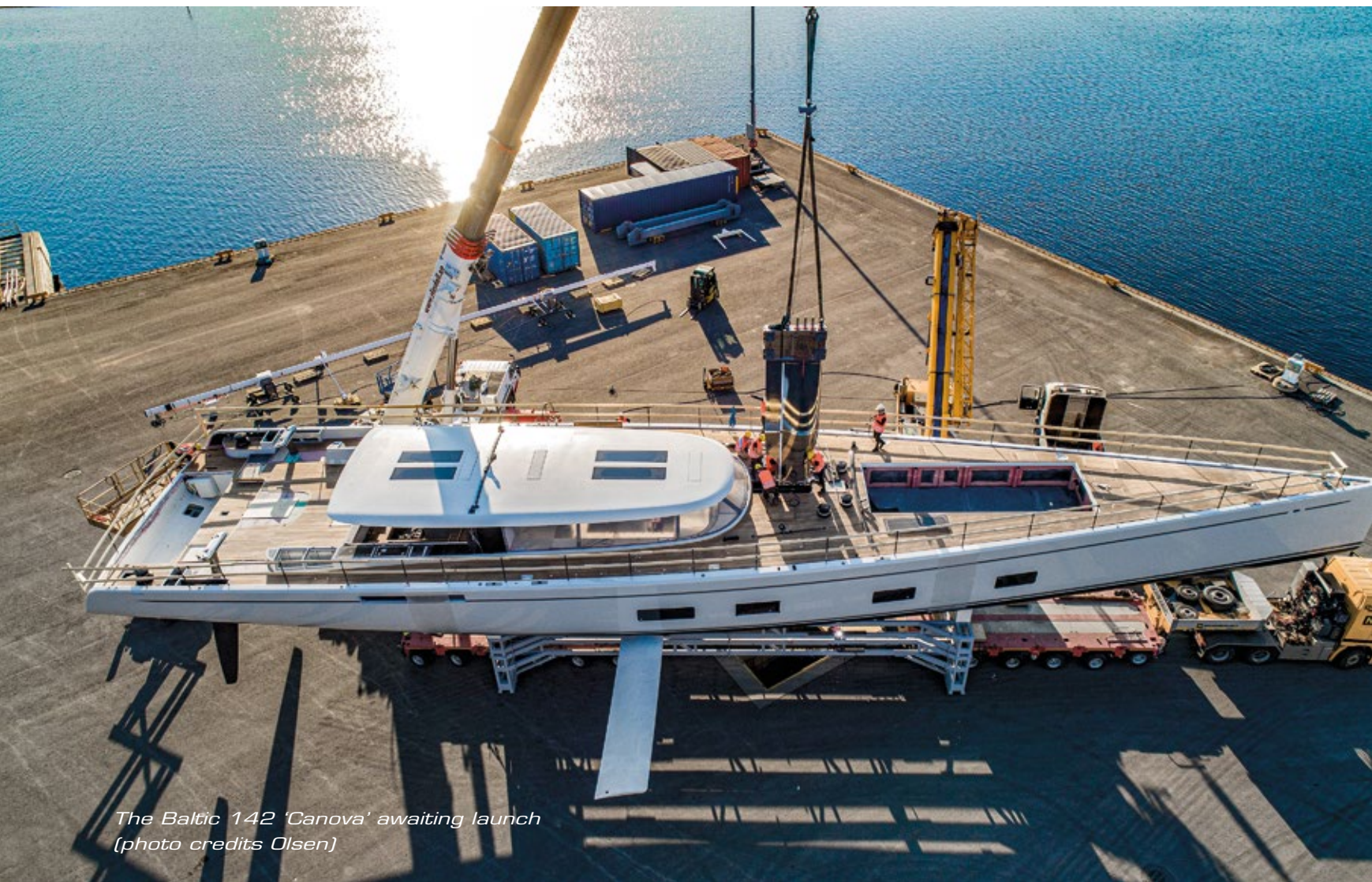
than carbon with which foils are made, to prevent the foil from getting out of shape as that could alter the smooth running of the same along the four sets of ball bearings installed. Furthermore each set is made up of four boxes with 25 Torlon roller bearings installed into titanium slots which, when the boat is not moving can be adjusted to modify the angle with which the foil will meet the water. A powerful electrically operated winch installed at deck level is used to manoeuvre the foil inside its container by deploying pulleys and cables which run up to the winch. All of this gear and more of it had to be installed in the least invasive way possible so as to leave ample fruition of the interior spaces concerned. However the core of the matter was in the lack of space in the bilges area below the flooring where the foil and



*The DSS foil as it protrudes from the Baltic 142 (photo credits Eva-Stina Kjellman)*

its mechanisms are situated accordingly below the waterline which is exactly where the yacht's sections tend to narrow. Consequently small modifications had to be carried out onto the existing hull.





# Superyacht with wings

## TECHNICAL

### Baltic 142 and DSS

#### THE FUTURE IS WITH WINGS

This new sailing yacht from Baltic bets on the innovation matured over the last decade, with foils and wings, in a less extreme version than 'flying' foils. Nevertheless it is thanks to DSS which exploits the sole condition for a

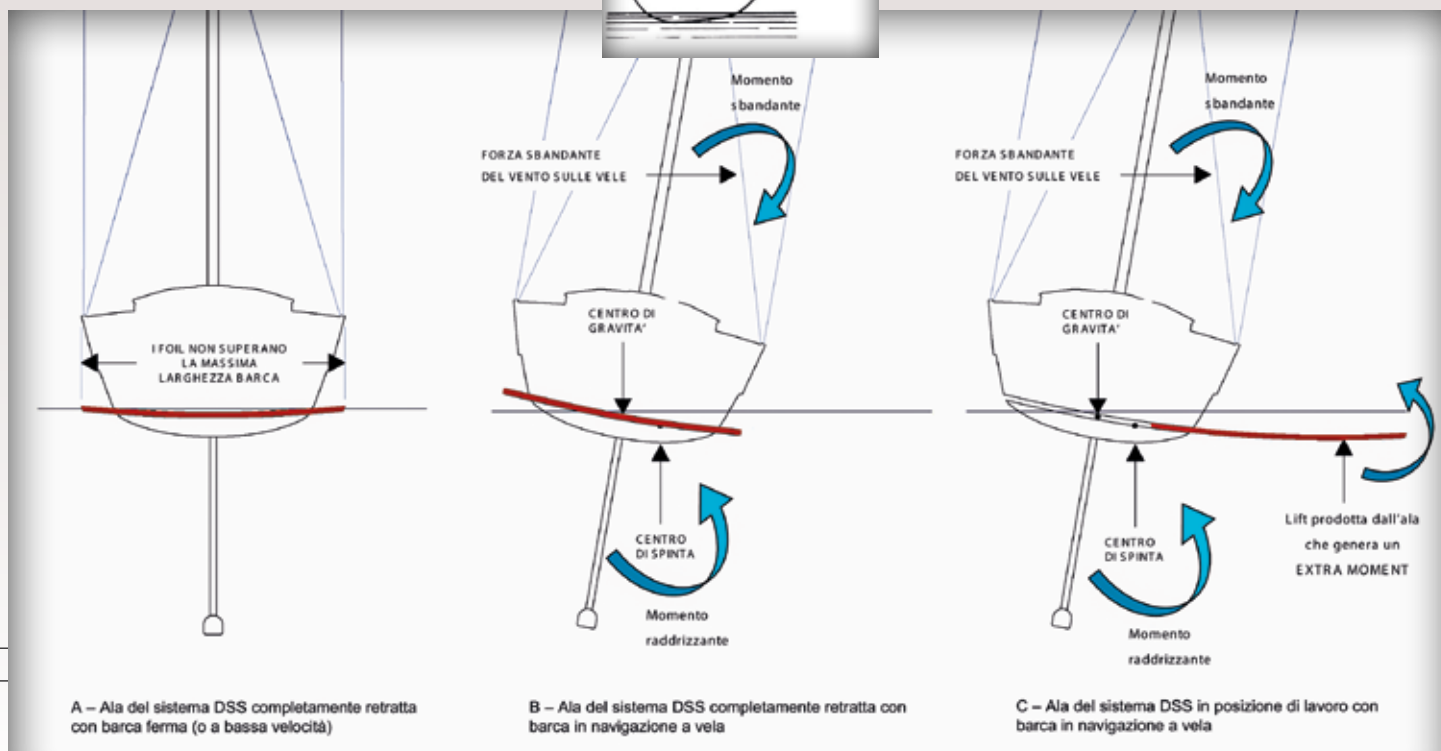
boat to move along the surface - by dividing two very diverse fluids: air and water. This special condition thanks to the DSS which has a righting effect thus reducing the angle of heel and lifts the boat more upright improving comfort and performance. Anyone who has sailed up-

#### HOW THE DYNAMIC STABILITY SYSTEM (DSS) WORKS

As Stefano Gerardi (professional yachtsman) wishes to underscore as well as being one of Infiniti Yachts founding members: "DSS is rather like an obvious measure because it allows you to exploit, with so many difficulties, a force which nature hands to us gratuitously". The DSS foil is installed into a waterlogged container placed beam to beam across the hull under the flooring. In very light winds it is left inside the yacht, as the yacht picks up momentum the downwind side is pushed out. The foil is slipped out also on large yachts via an efficient ensemble of pulleys, mechanisms and cars running on tracks in much the same way as those sliding seats in watercraft used in rowing competitions. Should the foil crash into something in the water it will bend aft towards the stern; if the pressure of the load is excessive it is designed to break up before any damage can be done to the hull itself. As we were saying as wind and angle of heel increase, the foil is set accordingly and is made to slip out of the hull on the downwind side generating 'lift' in much the same way the wing of an aircraft would. This lift is exercised it at some distance from

the hull (over six metres) and represents leverage force engendering an extra righting effect (lift x leverage force) which rights the boat in some cases up to the boat's horizontal plane as can be seen in figure A. As is known the degree of lift is dependent on boat speed (from which the wording dynamic stability): therefore as wind speed and boat speed grow so does the lift force developed by the foil downwind which allows the boat to remain upright thereby exploiting wind force fully. In practical terms the DSS carries out the same function as crew members do on relatively small boats when they sit upwind along the decks to contrast wind force with their respective body weights to keep the boat as upright as possible to better exploit wind force and to sail faster.

On the contrary when sailing on a close haul without DSS, as wind speed increases the yacht will heel more as there's more pressure on the sails and what keeps the yacht stable enough is the proportion of the weight of the bulb keel compared to the yacht's hull shape and displacement. By reducing the sail area exposed, pressure will be less and consequently so will the angle of heel decrease. This is the way to find the yacht's best equilibrium. But the DSS foil is not limited to decreasing







*The new Baltic 142 with its DSS foil ready for initial testing in water*

wind even for a few hours will have realized that any sail boat on a close haul will sail a lot slower, heeling at more than 20° than when 'running before' where the boat will sail upright and faster! We're talking about the obvious, but we know that often enough obvious things are the ones more difficult to understand just as Gordon Kay highlights in the course of our interview (Kindly refer to the appropriate box for more information).

the angle of heel as it uprights the yacht more: since as boat speed increases so does the lift generated by the foil downwind increase to the point where the hull skims the surface thus reducing the immersed area and with it, drag. In a nutshell with DSS the boat is more upright and rises a little out of the water which translates into greater performance in terms of boat speed as drag is less and considerably less than that generated by the foil itself.

The graph shows the performance of a 100' infinity with and without DSS. The derived comparative study highlights the following: if in a following sea or running before 30% to 40% improvements in terms of boat speed are possible, when on a close haul the DSS is less rewarding. This means foils are not so necessary in this instance just as much as they are not deployed in a light breeze. The foil is recovered and stowed accordingly. Getting back to a close haul, where low speeds are usual (therefore little lift is generated) and more drag occurs which can make little difference with DSS, but still significant results in Velocity Made Good or VMG towards a given waypoint with DSS there can be improvements, from as much as



*Figure A1, left, shows how the foil is influential when retracted into the hull when the yacht is not moving or is doing so very slowly.*

*Figure A2, at centre, shows how the foil is influential when retracted into the hull also when the yacht is heeling due to the effect of the wind force on the sails. In the given case, just as for a sailing boat without DSS, stability is guaranteed in the main by the weight of the bulb keel and by the shape of the hull itself.*

*Figure A3, right, shows the foil is poised to work on the downwind side. The foil in this mode generates lift which accrues righting effect (lift x leverage) which increases the yacht's righting momentum.*

*In the small picture, DSS carries out the same work crew members do on a small centreboard when they move to the upwind edge to contrast wind generated heel with their own weight, thus allowing the boat to proceed while exploiting wind force to the full.*

*Above, A 36GT Infinity sailing with DSS foil downwind in (figure 1). Looking at the boat from the upwind side (figure 2) you can see how much the hull has risen off the water thanks to the foil's lifting effect.*

10 to 15%. In the given case use of a foil translates into a sharper upwind sailing angle and enhanced stability over waves which entails slowing down less with more constant speeds. This is a further advantage brought about by a long and large foil which dampens pitch and roll. The result is, enhanced stability in the flow contouring sails and overhangs which improve overall efficiency and not only. With a smoother ride over waves it is easier to steer and obviously comfort increases proportionally as well while offering the feeling you are steering/sailing something bigger and more comfortable. And this is the value added factor which is appreciated most in cruiser yachts, where speed is secondary to comfort, specially

# Superyacht with wings

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## TECHNICAL

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### Baltic 142 and DSS

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when it is not invasive and easy enough to obtain, as Stefano Gerardi underscores again, *"DSS is so simple that unlike other similar systems like water ballast and canting keels, it can be used by everyone. The foil is either inside or out. It can be deployed or not as it works in synergy with the traditional keels that carry out their work anyway. And if I make a mistake and slip out the foil the wrong side, upwind, it will have no effect and nothing happens"*.

So what have we here, an ideal way by which to safely increase any sailing boat's performance, considering the

minimum impact caused to the interiors: All of the DSS installed remains below the floor boards and does not take up any useful space. But is it worth installing, in terms of performance, on an existing sailing yacht? Setting aside construction problems, that should be considered specifically as each case arises, DSS betters performance on any sailing boat, even existing ones. Certainly when part of a new project design as for the Infiniti line then all of the potential can be fully exploited.

For further information: [www.infinitiyachts.com](http://www.infinitiyachts.com)

#### INTERVIEW WITH GORDON KAY

Hugh Welbourn renowned British project designer dedicated to competition sailing yachts including America's Cup racers came up with DSS more than a decade ago. But from the initial stages till today, much R&D went into this project to fine tune the system to what it has become. This involved patents, the founding of a company Infiniti Yachts in 2010, which was created expressly to design and produce performing sailing yachts with DSS.

Gordon Kay project manager and experienced skipper, is the company's driving force, he's been flanking Hugh Welbourn in developing and in the promotion of DSS. Thanks to Gordon's determination in moving DSS forward and finally today, ten years on, spent in trying to convince yachtsmen and shipyards of the benefits and validity of his proposals backed up with results obtained, he has finally achieved deserved recognition for his efforts; with the installation of DSS into a large superyacht cruiser a Baltic 142' which is set to revolutionize and re define some of the standards concerning large sailing yachts in the foreseeable future.

**DSS has been installed into a large yacht from an influential, highly considered shipyard: how did you reach this goal?**

This Baltic 142 DSS, is without a shadow of doubt the largest most sophisticated of all the projects in which the Infiniti team has been ever involved with. Thanks to a special client and an extraordinary shipyard such as Baltic Yachts, something which was unimaginable only a few years ago has now become tangible reality. We've simply carried out loads of work, study, tests and feasibility studies geared to a yacht of this size and sort. The results obtained proved what we've been saying for years: DSS endowed yachts are faster and more comfortable than others without. Simple! Point made and I rest my case.



**Well, behind such a declaration, there are surely many hidden convictions which have been confirmed by years of intensive work.**

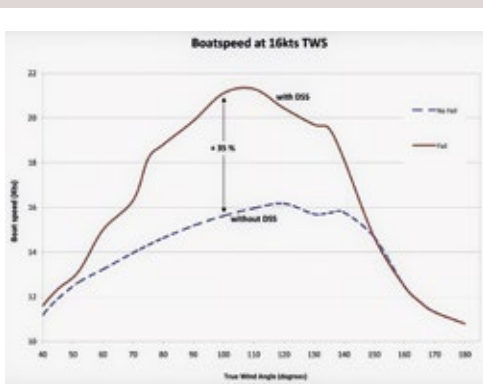
Certainly! Our team is at the forefront in terms of innovation and technical development, with a clear vision, freed from past ties, and determined to "never have the latest yacht of the preceding generation again". All this is not easily acceptable to the sailing boat world establishment across the globe, to prove it we've taken years to get DSS accepted also in the

cruising sector. And Canova the Baltic 142 is the spearhead everyone in this field is focused on. In fact we're currently working with Baltic toward the new generation of Super yachts Baltic "powered by Infinity" in collaboration with Micheletti and Partners in Milan. This relationship is similar to the one AMG enjoys with Mercedes (AMG is a German company known for its collaboration with Mercedes-Benz whose goal it is to draw up sports models for the German brand – (edn.) It stems from symbiosis and a shared vision which has become reality with the launching of Canova. But Canova is only the first step along the road ahead in terms of development and evolution. Expect to be seeing an even more innovative future generation...

**What do you mean exactly? Can you expand on that?**

We've always tried to challenge status quo here at Infiniti. We define that kind of mentality as being "flat-earthed". It has been conditioning this sector which is so rich with innovative potential, while endeavouring to produce yachts which can re define kinds. Without any exception time and time again for every new project this has been the practice. The 142 is another important chapter along the way. In fact Canova can be viewed as a source of inspiration for one of our more innovative projects, the 62 Infiniti catamaran on which we're planning to start production any time now. The project is for an expert owner who simply was not satisfied with any of the offers made available and this catamaran is





*The graph shows the 100' Infiniti's performance at several points of sailing with 16 knots of wind with and without DSS. If when running before, in terms of speed there can be improvements by as much as 30 to 40%, when close hauling DSS is less performing due to lower speeds involved (therefore less lift) and the inevitable drag effect is greater. However in every case a tighter angle can be held with more stability over waves*

*which avoids crashing and slowing down which translates into more constant speeds. All of this triggers off enhanced Velocity Made Good (VMG) towards upwind waypoints.*

an extremely comfortable fast cruiser while it substantially raises the bench mark all round. Thanks to DSS foils, pitch is significantly reduced which is something catamarans are heavily exposed to; as well as the risk of capsizing. Also the high risk of burying the downwind hull into the sea causing subsequent pitch-poling is reduced. We believe no other yacht of the kind can equal our performance. Beyond all this, with Micheletti and Partners we have come up with visionary spaces and layouts. More details will be released once construction work is underway.

**This is all about large yachts what about smaller ones, what are you are working?**

We're working on other projects like Infinity 52, a sort of supercar on water on which we've abandoned hydraulic controls for electric ones in terms of winches but not only. Sheets, halyards and sails respond immediately at the push of a button with the efficiency and promptness typical of electric engines. On our web site [www.infiniyachts.com](http://www.infiniyachts.com) there are drawings, sketches and renderings available for the racer version as well as the cruiser one. There's Infinity 56 a semi custom production for extensive blue water cruising which is nearing production phase. The same team which handled project design work of the Baltic 142. This one is a yacht which should redefine fast cruisers while being highly comfortable an ideal top of the range boat of this size.

**DSS is primarily useful in making sailing boats more comfortable and improving performance: have you ever envisaged extending the range of use in considering full foiling?**

Flying boats? Certainly! Infiniti is developing a flying 9.9 metre at a price which will be affordable by most. It is destined to be distributed on a very large scale. We'll be releasing all pertinent details sooner rather than later.

**So, to sum up how are you envisaging DSS in the coming future?**

DSS is gaining more and more consensus all the time and is considered a winner by many. Among these, our clients who share our passion for innovation. Naturally, there are plenty of sceptics, but we've learnt that there will always be people who believe the world is flat... but they are nearly extinct!

## BALTIC 142 CANOVA

Since inception the new 43 metre from Finland's Baltic shipyard has been presented as one of the most technologically advanced sailing yachts. Surely due to DSS but not only.

In fact, notwithstanding the reduction in the angle of heel which is brought about by the DSS, we're talking about from 7° to 10° approximately. Imagine the owner's bed is on gimbals and can absorb another 14° in heel. In practical terms the owner can always sleep on a perfectly horizontal plane! This is to better understand to what extent comfort plays in this project. With this theme in mind, every cabin is mounted onto silent blocks which dampen all vibration.

The same care has been addressed to noise and smell. The yacht is completely shut out internally from every sort of smell, there are no opening ports and the air is constantly filtered, dehumidified and conditioned to best enjoy perfect humidity and temperature. As for noise a diesel electric engine has been coupled to four separate sets of lithium batteries. This way translates in less fuel consumption and requires less interior space and is specially noiseless. A way of reducing the deployment of gen. sets has been installed and only six hours, instead of the usual 24 normally needed on a yacht of this size, need to be used. When sailing Canova can switch the generators off because the propeller blades which are left to spin freely generate sufficient electricity with a loss of only half a knot in terms of boat speed when sailing at 14 knots. An excellent performance, thanks also to the yacht's construction material which notably is all in weight saving carbon.

For further information: [www.balticyachts.fi](http://www.balticyachts.fi)

## TECHNICAL DATA

Technical data - LOA: 43.30 m- LWL: 41.60 m- Beam: 9 m- Displacement: 140 t.

