# NAVALHEAD

## TALKING TO THE WATER





# THE NEW FRONTIER OF HYDRODYNAMICS

Hydrodynamics is often described through numbers: speed, power, resistance, fuel consumption. But before the numbers, there is something far more complex: the encounter between a geometry and the water. At NavalHEAD, this is where the design process begins. More than ten years ago, this philosophy led Andrea Agrusta and his team to study the blade bulb, a solution already known in the world of large vessels, and to profoundly reinterpret its geometries and operation for application to yachts, initially on semi-displacement and semi-planing hulls.

It was not a matter of transferring a shape from a ship to a yacht. It was about understanding its physical principle and rethinking it for entirely different speeds, dimensions, displacements and operating conditions. Since then, NavalHEAD has continued to develop this technology through research, CFD and applications on real projects. Today, the blade bulb, in its various interpretations, has become part of the yacht design landscape. Meanwhile, NavalHEAD is already looking beyond it. The new frontier lies in truly fast boats.

**Andrea, you often say that NavalHEAD knows how to “talk to the water”. What does that mean?**

“It means knowing it well enough to predict what it will do. To me, this is the essence of hydrodynamics. When we look at a geometry, we do not simply see a surface. We already imagine the water flowing around it: where it will accelerate, where pressures will rise or fall, how the wave will form and propagate, what trim the boat will tend to assume, and how its behaviour will change when the bow meets the sea.

The process, therefore, does not begin with the shape. It begins with what we want to achieve. First, we ask ourselves: what do we want the water to do? Then we design the geometry capable of producing that response. This is what talking to the water means to us. Geometries are our language.”

**But today we have CFD. Is it not the computer that predicts all this?**

“CFD is an extraordinary tool and has radically changed our ability to analyse complex phenomena. It allows us to

***MORE THAN TEN YEARS AGO, NAVALHEAD REINTERPRETED THE BLADE BULB, BRINGING IT FROM LARGE VESSELS INTO THE WORLD OF YACHTING. TODAY, ANDREA AGRUSTA AND HIS TEAM ARE WORKING ON THE NEXT STEP: NEW GEOMETRIES FOR TRULY FAST BOATS. THIS RESEARCH STEMS FROM A PRECISE PRINCIPLE: KNOWING THE WATER DEEPLY ENOUGH TO PREDICT ITS RESPONSE***

## WE ARE INTERESTED IN THE QUALITY OF PERFORMANCE

**OUR BOATS MUST INSPIRE EMOTION. AND THEY MUST DO SO AT THE HELM, EVEN BEFORE THEY ARE SEEN PASSING BY**



measure, compare, verify and optimise with a level of detail that was unimaginable until just a few years ago.

But there is a fundamental difference between using a tool and having a deep understanding of the phenomenon being studied. Software can provide extremely sophisticated answers. First, however, someone has to know what question to ask it. Hydrodynamics is not about generating a hundred geometries, calculating them and choosing the one that returns the best number. You need to understand the physical phenomenon deeply enough to imagine which geometric change might produce a specific response from the water. Then comes CFD: it verifies the intuition, quantifies it, challenges it and makes it possible to refine it. But knowledge comes first. Hydrodynamic intuition precedes calculation."

**Is this the approach from which your work on the blade bulb emerged?**

"Exactly. We did not invent the blade bulb. The principle already existed and was used mainly on large vessels, particularly military ships and ferries. But more than ten years ago, we began asking ourselves what would happen if we reinterpreted that philosophy for yachting. And it is important to emphasise one thing: we did not simply take an existing geometry and scale it down. That would have made no technical sense. A military ship, a ferry and a semi-planing yacht belong to profoundly different hydrodynamic worlds.

We took the physical principle and redesigned everything else. That question led to years of research, simulations, optimisations and different geometries, developed both as part of our internal research and for specific applications in our clients' projects."

**Why a blade, specifically? What changes compared with a traditional bulb?**

"A traditional bulb generally has substantial volume and more rounded sections. The blade bulb follows a different philosophy. It does not seek volume. It really is a blade. A properly designed conventional bulb can affect the vessel's wave system and, under certain conditions, produce an effect comparable to that of greater hydrodynamic length, with benefits in terms of resistance. With the blade bulb, we wanted to go further. We are not interested only in how the water perceives the boat as it moves forward. We are interested in how it perceives the boat when it encounters the sea. And that is where the problem becomes far more interesting."

**So when you talk about making the water perceive a longer boat, you are not referring only to resistance?**

"Absolutely not. And this is a fundamental distinction. A boat does not navigate through flat water inside a computer. It navigates at sea. It encounters a wave. The bow rises. The pressures change. The trim changes. Vertical accelerations develop. The hull passes through the wave and then comes back down. All this determines the quality of the ride at least as much as resistance to forward motion. Through geometry, we also want to control this interaction.

I like to put it in deliberately simple terms: we want the water to perceive a longer boat even when a wave arrives. Behind such a simple phrase lies a great deal of hydrodynamics. It means acting not only on efficiency, but also on seakeeping, dynamic trim, manoeuvrability, safety and the comfort of the people on board."



**So performance is not measured only in knots?**

"For me, it has never been measured only in knots. A boat can have an extraordinary top speed in ideal conditions and become mediocre as soon as the sea changes. At that point, what have we really designed? Speed performance without comfort, safety, manoeuvrability and seakeeping is pointless. True performance is the ability to go fast and do it well.

It means maintaining the correct trim. Limiting accelerations and impacts. Having a boat that is predictable, controllable and safe. It means allowing the people on board to make real use of that performance without paying for it in terms of comfort. Top speed is a number. We are interested in the quality of performance. And there is one aspect that numbers alone cannot convey. Anyone who has driven or piloted a boat designed by NavalHEAD knows it. Regardless of size, type or speed, we always seek something that goes beyond the performance data: we want a boat to stir emotion in the person at the helm.

It is a feeling that is difficult to translate into a coefficient. It comes from the balance of the hull, the precision with which it responds to the helm, the way it accelerates, meets a wave, enters a turn and regains its trim. When all these elements work together, the boat is not simply fast or efficient. It is beautiful to drive. And that matters enormously to us.

Because we can measure resistance, accelerations, trim and pressures. But in the end, behind all those numbers, there has to be a boat capable of conveying something. Our boats must inspire emotion. And they must do so at the helm, even before they are seen passing by."

**Today, however, the blade bulb is far more widespread than when you began studying it. Can that research be considered complete?**

"Quite the opposite. Seeing a solution that was initially unusual gradually become part of the technical landscape of yachting is a source of great satisfaction. But it also means that the time has come to go further. Because the cutting edge keeps moving. Being at the forefront does not mean finding one solution and continuing to replicate it for twenty years.

It means recognising when that solution has become part of the industry's shared knowledge and already beginning to ask the next question. More than ten years ago, we asked ourselves why a principle used on large vessels could not be profoundly reinterpreted for semi-displacement and semi-planing boats. Today, we are asking ourselves the same question once again. Just one step further."

**What is the question today?**

"It is very simple. Why stop at moderately fast boats? Why not rethink these geometries once again and bring this philosophy to truly fast boats? That is the research we are working on now."

**What changes when speed really increases?**

"Almost everything changes. Sensitivity to geometric variations and the complexity of dynamic phenomena increase enormously. Pressure distributions, trim, accelerations and interaction with the free surface all change. An apparently small modification can have very significant consequences for the boat's overall behaviour. And that is precisely what makes the problem so interesting.

Using CFD, we are developing a new generation of NavalHEAD geometries specifically conceived for much higher speeds, and we are already working confidentially on several new projects. We are still in the research and development phase, so it would make no sense to anticipate conclusions that still need to be verified and validated. But we know very well where we want



to go. We want to understand how far this new generation of blade bulbs can allow us to address resistance, dynamic trim, wave impact, seakeeping, manoeuvrability and comfort simultaneously. Because these are different aspects of the same problem. The boat is one. So is the water."

**Does placing such an unusual geometry ahead of the bow of a very fast boat not also involve risks?**

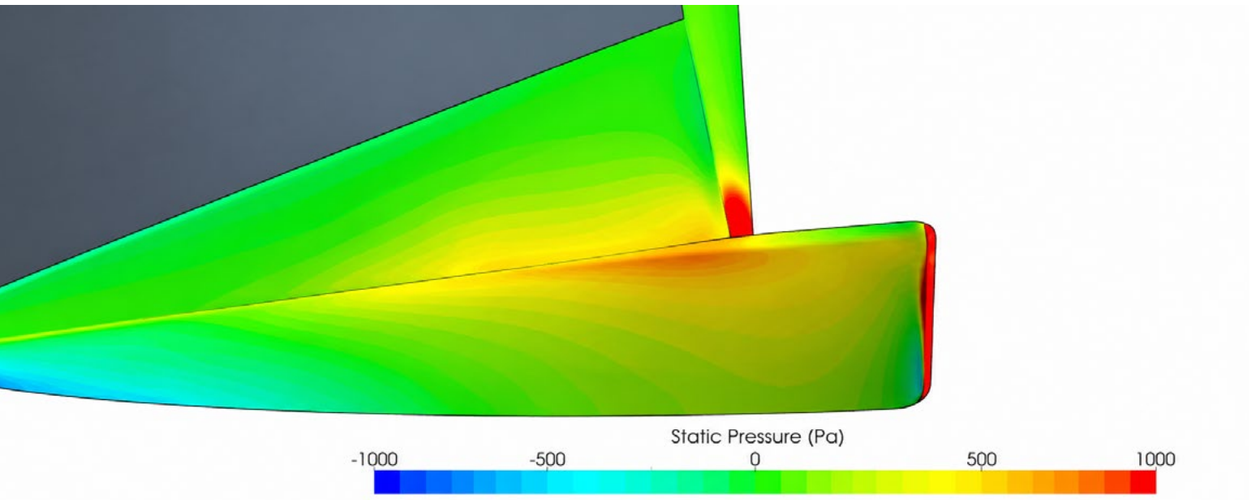
"Certainly, if the approach were simply to take the blade bulb from a semi-displacement boat and place it in front of a fast hull. But that would be exactly the opposite of what we are doing. We do not start with the blade bulb. We start with the water. First, we envisage the phenomenon we want to control.

We study the pressures, the trim, the wave system, the accelerations and the dynamic interaction between the hull and the free surface. We need to know what behaviour we want to achieve. Only then does the geometry emerge. We are not putting a blade in front of a fast boat to see what happens. We know what we want to happen. We design the geometry that must persuade the water to make it happen. That is the difference."

**Is this what being at the forefront means to you?**

"To me, being at the forefront does not mean doing something strange just to make it look new. Nor does it mean pursuing innovation as an exercise in style. It means understanding a field so deeply that you can see the next step before that step becomes apparent to others. That is what we sought to do more than ten years ago with the blade bulb in yachting.

Today, that philosophy has evolved, has been interpreted in many ways and has become part of the sector's technical repertoire. Meanwhile, we are already asking the next question. Because at NavalHEAD, hydrodynamics is in our blood. We know the water. We know how to listen to it, how to predict its response and how to talk to it through our geometries. We have always done so. Now we want to see how far this knowledge can take us when speed truly increases."






NavalHEAD

NEW LOOK, SAME MISSION.

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