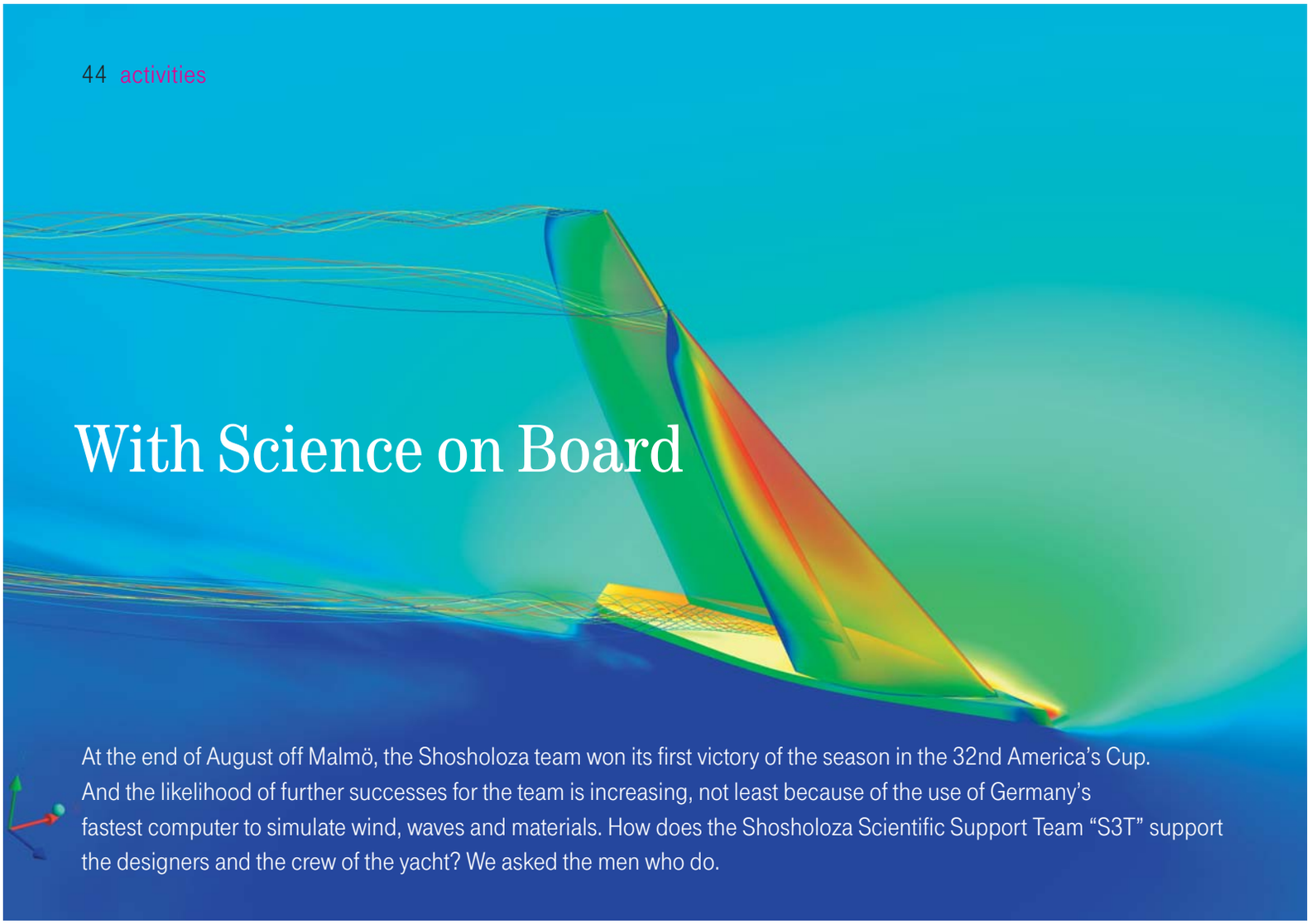

With Science on Board

At the end of August off Malmö, the Shosholoza team won its first victory of the season in the 32nd America's Cup. And the likelihood of further successes for the team is increasing, not least because of the use of Germany's fastest computer to simulate wind, waves and materials. How does the Shosholoza Scientific Support Team "S3T" support the designers and the crew of the yacht? We asked the men who do.

Congratulations!

Winner of the Best Practice competition

Gerhard Bickmann (above), managing director of Finance & Administration at Kabel BW, won the competition in issue 01/05 and has the chance to sign on as the 18th "crew member" of the Shosholoza.
The e-mail from Heiko Mehlhop of the Kreissparkasse savings bank in Grafschaft Diepholz was the one chosen in the draw from issue 02/05, so he attended the Louis Vuitton sailing regatta live in Trapani, Sicily.

Mr Heib, as managing director of the joint venture "HWW — Supercomputers for Science and Business," you set up the S3T. How does science support sailing?

Michael Heib: A lot of it is down to the HWW, in which, as well as ourselves (T-Systems), the regional government of Baden-Württemberg, Porsche AG and the universities of Karlsruhe, Stuttgart and Heidelberg are involved. Like with Formula 1, it's a matter of extracting the last iota of power. Success depends 30 percent on the design of the boat, 30–40 percent on the crew and 30–40 percent on the weather. Our support is mainly in optimizing the design and the tactics.

How do you do that?

Prof. Michael M. Resch: By simulation. We use supercomputers to simulate how the hull, mast, keel and sail will behave in different wind and wave situations and how these things interact. You can only do that with extremely high computing power, and we provide that for the Shosholoza team in the form of Germany's fastest computer, which is also Europe's fastest vector computer.

Jason — but you as the designer don't have to do number-crunching, do you?

Jason Ker: No, Professor Resch and his colleagues visualize their results in a virtual room, called CAVE*. There we can try things out that no-one has ever experienced! Because of the high computer power we can make some improvements to critical components for the first time, because they are just too complex for conventional computer capacity.

How should we imagine this cave, which is surely a deliberate reference to Plato's "Allegory of the Cave"?

Resch: It is a type of virtual wind and wave tunnel. The designers wear glasses through which they see three-dimensional images to the left and right, in front of them and beneath them, giving them the sensation that they are standing in the middle of this simulation. We can bring the boat with all its paraphernalia into this room, and artificially make the wind blow and the waves pound. As experts in fast, efficient and accurate simulation and visualization, we work with experts from other specialist fields such as flow mechanics.

Professor Heuveline, you are one of those experts. How does it work?

Professor Vincent Heuveline: In our computers there are over 1,000 processors working in parallel. This means we can take account of the so-called instationary (time-dependent) flows with which air and water attack the hull, mast and sail

Germany's fastest computer is used to simulate flow conditions in air and water to optimize the design of the Shosholoza

of the Shosholoza. We also calculate the effect of the turbulence created by other boats. Because it's not only the tactic of the angle at which the bow cuts through the waves in a particular situation that is important, but also the flow problems which a maneuver by the Shosholoza will cause for an opponent — and vice versa.

Resch: Most of these phenomena — such as how the sail behaves — are actually already well understood. Our contribution is to bring all these things together and calculate them all at the same time within 30 or 60 seconds. It's only in the last few years that people have begun to understand how it all works.

What effects does this scientific contribution have on the team's success in wind and waves?

Ker: We have only been working together since June, but I'm already convinced that this partnership will continue to be very useful to us.

Heuveline: Like in Formula 1, we too can only improve performance in small steps — but they can then be crucial for victory. Our simulations can sometimes suggest strategies that run counter to the team's intuition. Together with them, we then try it out in practice to see whether the performance is improved. Conversely, some of our recommendations can be proved totally wrong by the yachtsmen's intuition. Together we find the best way.

At the end of the day, can everything in sailing be calculated?

Resch: No, because every scientist makes certain assumptions and simplifications in his calculations. This means that the calculations are just a good aid in getting closer to a solution. For example, by simulating the sail we can avoid going completely the wrong way in our development. On the one hand, we can say what definitely won't work, and on the other, we can provide lots of promising leads for further developments. But the yachtsmen have to do the sailing themselves, and see whether it works.

Heib: We will carry on supporting them, because our commitment as official chief sponsor is about more than just providing money. For example, we are investigating how we can use our expertise to improve our weather forecasts. With the support of universities, computer resources and such a lot of in-house expertise, we may be able to compensate for this disadvantage. And of course our help with high-tech IT services and professional marketing support goes without saying. So we're right on course.

Olympic Games 2008

T-Systems sponsors the sailing team

T-Systems is sponsoring a team of top sailors from the best German teams in the Tornado, 49er and Yngling classes, at least until the Olympic Games in 2008 in Beijing. Thanks to this support, the six most promising German teams can concentrate entirely on their training and also benefit from the best possible materials.
This commitment is already producing results: Even in this season, the T-Systems 2008 team has already chalked up victories at Hyères (France) and during the Kiel Week regatta.

Michael Heib is vice president of CSS Architecture at T-Systems and managing director of the joint venture "HWW — Supercomputers for science and business." He sees the scientific support for the Shosholoza as an outstanding reference for customers in the Industry Line Manufacturing and Industry Line Public sectors. As an air and space engineer, he can "talk the same language about flow" with yachtsmen.

Prof. Vincent Heuveline is responsible for numerics on high-performance computers at the computer center of the University of Karlsruhe (TH) and also teaches Applied Mathematics there. Originally from Nice, the head of the Scientific Advisory Board for the Shosholoza team found a connection between sailing and mathematics "because I rediscovered the beauty of flow in sailing."

In the Shosholoza, **Jason Ker** has built the first boat to be constructed entirely according to the new requirements of the Version 5.0 rule for the America's Cup. The British ship designer and his team spent a total of 25,000 man hours on building the 24-ton yacht. Thanks to the simulation, he is able to "go beyond what could be calculated before, to make the design even better."

Prof. Michael M. Resch is director of the High-performance Computing Center at Stuttgart and Professor of High-performance Computing at the university there. He simulates and visualizes the behavior of the Shosholoza, but "in reality I can't even look at a boat without feeling seasick."

PHOTOS: AP, BRIT MOULIN, DI MEEK

LINKS
You can find more information on Shosholoza at:
www.t-systems.de/americascup/engl

*Cave Automatic Virtual Environment