

## Speed bumps give humpbacks a surprise boost

13 Jan 01

THE mysterious lumps on the fins and heads of humpback whales make the behemoths more manoeuvrable, say American researchers. The finding may inspire new designs for boats and aircraft.

The lumps, or tubercles, have long puzzled biologists. So Philip Watts of Applied Fluids Engineering, a company based in Long Beach, California, and Frank Fish of West Chester University in Pennsylvania tried simulating the effect of the tubercles on the leading edge of whales' fins. To their surprise, they found that the tubercles not only reduce drag by 10 per cent, but also increase lift by 5 per cent. "It's very rare to find something that does both at the same time," says Watts. "Usually something that reduces drag also reduces lift and vice versa. Nothing else like it is known."

The effects seem to be due mainly to the creation of a series of low-pressure regions across the fin's upper surface rather than a continuous one. These regions increase lift, and splitting them this way appears to reduce drag too. "It's as if you're dividing your wing up into different sections," Watts says. "It's counterintuitive-at first we didn't believe our simulations."

Watts and Fish hope that their work could improve the manoeuvrability of planes. "At the moment, aeronautical engineers think leading edges have to be straight," Watts says.

The tubercles help humpbacks make tight turns as they pursue their prey, Watts told a meeting on comparative biology in Chicago last week. He says it's the first evidence that tubercles have a purpose.

George Karniadakis, a fluid dynamicist at Brown University in Rhode Island, cautions that their simulations may be too simple. "But it's worth exploring further. If they are right, it would be easy to implement and could be very useful."

### Michael Le Page

From **New Scientist magazine**, vol 169 issue 2273, 13/01/2001, page 22

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