



Cambridge Society for the Application of Research

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# Why Aircraft Wings May Soon Grow Bumps!

Professor Holger Babinsky  
Professor of Aerodynamics  
Deputy Head of Department (Graduate Studies)  
University of Cambridge

7.30pm, Monday 3<sup>rd</sup> March, 2014

Wolfson Hall Lecture Theatre, Churchill College, Storey's Way, Cambridge

## The Lecture:

Improving the efficiency of modern transport aircraft continues to be an active area of research. Although the current design solution has now reached a high level of maturity, there are potential developments afoot that may force engineers to re-think the shape of the wings.

The most significant development is the possible introduction of 'laminar flow wings'. These have a subtly altered shape to promote a greater extent of 'laminar flow' (as opposed to turbulent flow which covers more than 90% of current wings). Laminar flow has a lower skin friction drag and this therefore has the potential to reduce aircraft drag considerably. However, the different shaping of the wing cross-section (the aerofoil) is likely to lead to the increase of another, more obscure, drag component: **wave drag**.

In this lecture I will begin by re-visiting how lift is generated by aerofoils (hopefully getting rid of some misconceptions) and why, in modern transonic aircraft, this leads to the generation of shock waves - the cause of wave drag.

Finding flow control devices that can alleviate the adverse effects of shock waves on wings has been an actively researched across the world for several decades. Lately, much work has focused on the three-dimensional 'shock control bump' which was first tested here in Cambridge more than a decade ago.

I will first explain the fundamental physical function of shock control bumps and then briefly describe the current research aimed at optimising this device for potential application on future wings.

## About the Speaker:

Holger Babinsky originates from Bavaria and studied Aerospace Engineering at Stuttgart University in Germany. He obtained a PhD in hypersonic aerodynamics from Cranfield University (UK) in 1994.

After 18 months as Research Associate at the Shock Wave Research Centre of Tohoku University in Sendai, Japan he returned to the UK to take up a position at the University of Cambridge.

He is now Professor of Aerodynamics and Chair of the Fluids Group as well as a Fellow of Magdalene College.

His main areas of research are in the field of experimental aerodynamics and associated measurement techniques. Apart from shock wave/boundary layer interactions which he has studied for more than 20 years his current research includes the aerodynamics of micro-air vehicles, road vehicles, wind turbines and flow control for transonic aircraft wings and supersonic engine inlets.

He is a Deputy Head of the Engineering Department (Graduate Studies), a Fellow of the Royal Aeronautical Society, an Associate Fellow of the American Institute of Aeronautics and Astronautics and a member of several RTO (NATO) advisory groups.

"I start by giving the wrong explanation and asking who has heard it; and every time 95% of the audience puts their hand up.

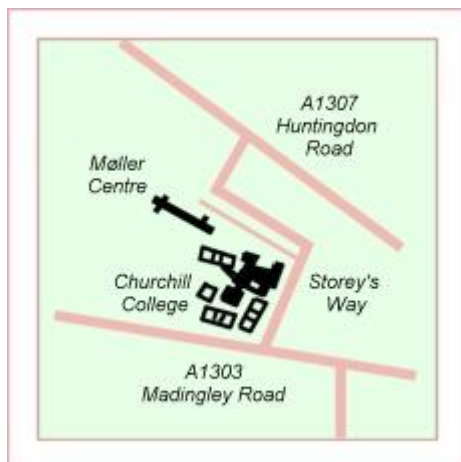
Only a handful will know that it is wrong."

*Professor Holger Babinsky:*

See more at:

<http://www.cam.ac.uk/research/news/how-wings-really-work#sthash.GCIzT93z.dpuf>

## Practical Matters



Those attending the CSAR lecture may park in the Senior Car Park on Churchill Road, which is off Storey's Way. More parking is available further along Churchill Road, and in the Möller Centre at the far end.

CSAR lectures are open to all; CSAR members are admitted free. Pupils and students may register for free membership at the lecture reception desk.

Non-members are asked to make a nominal contribution of £3.00.

Coffee and biscuits are available in the Wolfson Foyer from around 7pm. For further directions, see: [www.chu.cam.ac.uk/about/visitors/directions.php](http://www.chu.cam.ac.uk/about/visitors/directions.php)