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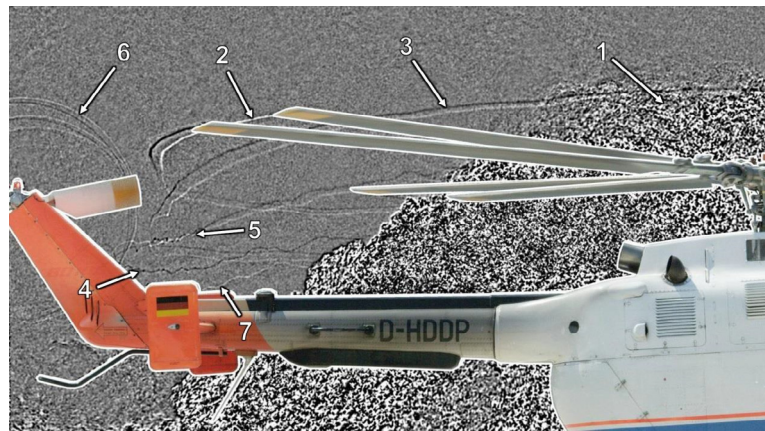
DIPARTIMENTO DI  
SCIENZE E  
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AEROSPAZIALI

## Optical Flow Diagnostics applied to Helicopter Rotors Flows at DLR

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Unsteady rotor aerodynamics is hard to predict numerically and still require intensive and innovative experimental testing techniques. The unsteady boundary layer transition, blade vortex interaction and dynamic stall are just a few of the topics that need to be investigated. Particle Image velocimetry (PIV), Background Oriented Schlieren Techniques (BOS) and Differential Infrared Thermography (DIT) have been developed and applied to helicopter rotors flows in wind tunnels and flight.

A sample of more recent results of these tests will be presented.



**Markus Raffel** received his degree in mechanical engineering in 1990 from the Technical University of Karlsruhe and his doctorate (Ph.D.) in 1993 from the Leibniz University Hannover, Germany. In 2001 he received the post-doctoral lecturing qualification (Habilitation) in Fluidmechanics at the Technischen Universität Clausthal. He started working on particle image velocimetry at DLR Goettingen in 1991 with emphasis on the development of Particle Image Velocimetry (PIV) recording techniques in high-speed flows. In this process he applied the method to a number of aerodynamic problems mainly in the context of rotorcraft investigations and worked on other optical flow diagnostic techniques like the Background Oriented Schlieren Technique (BOS). He is leading author of the text book on PIV published by Springer-Verlag in 1997 and 2007. He is heading the department for Helicopters of the DLR Institute for Aerodynamics and Flow Technology and has been a full professor at the Leibniz University Hannover since 2007.

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July, the 3rd, 2017 at 16:30  
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