

# **The Rise of Modern Aerodynamics in World War I**

**Michael Eckert**

Deutsches Museum, Forschungsinstitut, D-80538 Munich, Germany

[m.eckert@deutsches-museum.de](mailto:m.eckert@deutsches-museum.de)

When the Wright brothers made headlines with their first heavier-than-air human flight in 1903, aerodynamics was more tinkering than science. The principles of aerodynamic lift were developed only a few years later, independently, by Martin Wilhelm Kutta and Nikolai Egorovich Zhukovsky. However, the route from these principles to a theory which could be used for the design of airplanes was long and convoluted. Crucial steps were made during World War I in Ludwig Prandtl's Model Testing Facility ("Modell-Versuchsanstalt") at Göttingen where theoretical results were checked by wind tunnel measurements in the course of war contracts. Prandtl's airfoil theory, published in 1918 and 1919, together with the doctoral dissertations of his disciples Max Munk and Albert Betz, illustrate the evolution of aerodynamics from tinkering to science; they paved the way for the modern theory of flight. Yet Prandtl's airfoil theory had little impact on the actual design of airplanes during World War I – as is apparent from the transformation of the "flying boxes" prevalent before the war into streamlined airplanes after the war. The emergence of modern aerodynamics therefore raises a number of questions concerning the nature of the relationship between science and technology during World War I.