



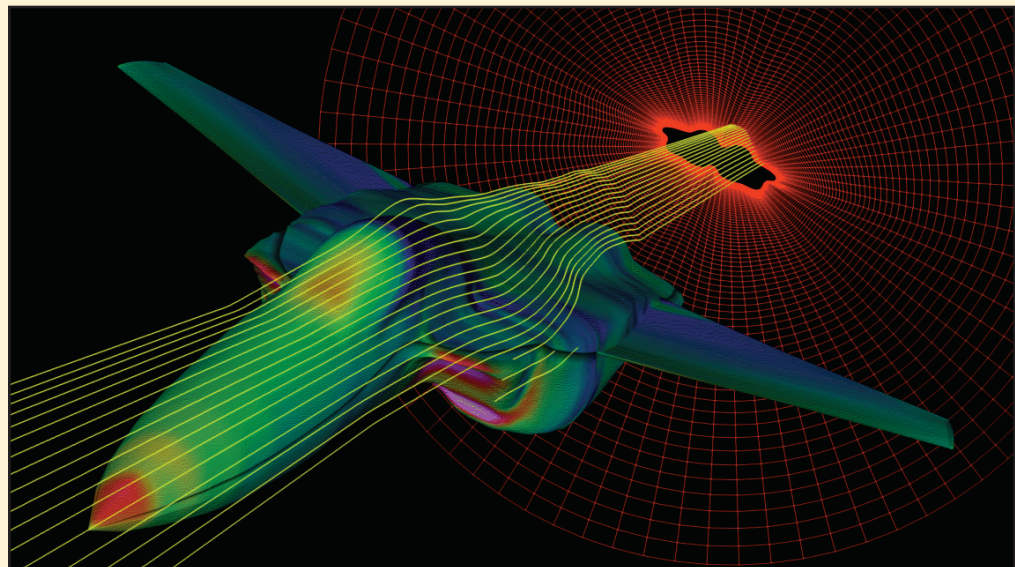
# Designing Aircraft

The flow of air (and water) has been studied for over a hundred years, but only recently have mathematicians begun to understand the complicated phenomenon of turbulence that is a crucial part of aerodynamics. With mathematics and modern computers, wind tunnels are now seldom used in aeronautical design.

The Navier-Stokes equations describe fluid flow, but there is no precise solution to these partial differential equations. The faster the fluid flow, the more a nonlinear term in the equations increases, which increases the difficulty of generating numerical solutions to the equations. So, turbulence affecting aircraft is especially hard to understand—beyond even the computational power of today’s supercomputers. Advances in theory are necessary to allow current technology access to the problem. Mathematicians are now verifying Richardson’s and Kolmogorov’s laws: two hypotheses which attempt to explain turbulence.

**For More Information:**

*What’s Happening in the Mathematical Sciences*, Vol. 3, Barry Cipra.



Photograph courtesy of NASA Ames Data Analysis Group.



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