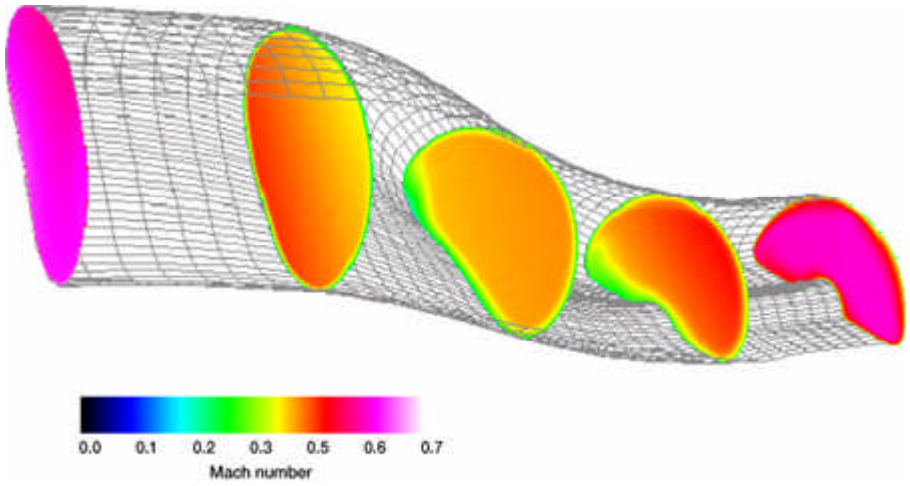
WIND Flow Solver Released



Mach number contours for flow through a subsonic diffuser with turning.

The WIND code is a general-purpose, structured, multizone, compressible flow solver that can be used to analyze steady or unsteady flow for a wide range of geometric configurations and over a wide range of flow conditions. WIND is the latest product of the NPARC Alliance, a formal partnership between the NASA Lewis Research Center and the Air Force Arnold Engineering Development Center (AEDC). WIND Version 1.0 was released in February 1998, and Version 2.0 will be released in February 1999.

The NPARC (National Program for Applications-Oriented Research in CFD) Alliance was established in 1992 with the goal of providing an applications-oriented computational fluid dynamics (CFD) system, primarily for aerospace flow simulation. This alliance is committed to the long-range maintenance and improvement of this capability, with teams focused on user support, code development, and validation. The unique talents and capabilities of its partners, plus the experience and insight of its government, industrial, and academic customers, are used to ensure that the alliance's efforts are cost-effective and responsive to users' needs.

The WIND code represents a merger of the capabilities of three existing computational fluid dynamics codes--NPARC (the original NPARC Alliance flow solver), NXAIR (an Air Force code used primarily for unsteady store separation problems), and NASTD (the primary flow solver at McDonnell Douglas, now part of Boeing). The development effort began in early 1997 using the NASTD code as the basis, and was carried out jointly between Lewis, AEDC, and Boeing. Recently, the Air Force Research Laboratory joined the effort. Funding for the work has been provided by NASA's High-Speed Research (HSR) Program, by AEDC, by Boeing, and by the Air Force's High Performance Computing Modernization Program.

A variety of physical models are available in the WIND code, allowing users to choose those appropriate to the problem being analyzed. These include

- Navier-Stokes, thin-layer Navier-Stokes, parabolized Navier-Stokes, or Euler equations
- Algebraic, one-equation, and two-equation turbulence models
- Perfect gas, frozen chemistry, equilibrium air, and finite rate chemistry models
- Abutting and/or overlapping grid zones

In addition, a variety of numerical models are available, including

- Explicit, scalar implicit, or block implicit solution operators
- Central, Coakley upwind, Roe upwind, and physical upwind explicit differencing--first to fifth order
- Implicit and explicit boundary conditions
- Second- and fourth-order explicit smoothing, boundary damping, and TVD[a] flux limiting
- Time step specification via a CFL[b] number, Global Newton iteration, and Runge-Kutta schemes
- Convergence acceleration using grid sequencing, local CFL numbers, and ramped CFL numbers

The WIND code is available to all U.S.-owned companies, public and private universities, and Government agencies. However, only U.S. citizens and resident aliens may access the software. Instructions for obtaining the code are available on the NPARC Alliance home page on the World Wide Web or from the NPARC Alliance User Support team.

Additional information about the NPARC Alliance and the WIND code is available:
NPARC Alliance -- http://www.arnold.af.mil/nparc/
WIND documentation -- http://www.grc.nasa.gov/WWW/winddocs/
WIND validation -- http://www.grc.nasa.gov/WWW/wind/valid/validation.html

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AEDC contact: NPARC Alliance User Support, (931) 454-7455, nparc-support@info.arnold.af.mil
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