Computer Models
For
Fire and Smoke

Model Name:	PHOENICS
Version:	3.3.1
Classification:	Field Model
Very Short Description:	PHOENICS is a general-purpose computational fluid dynamics (CFD) code for use by academia and industry as a design and analysis tool for any process involving fluid flow, combustion, and heat and mass transfer. The code employs the finite-volume technique and it has been applied across a wide range of industries, including aerospace, chemical process, power generation, biomedical, HVAC, health and safety, automobile, defence, environmental and electronics.
Modeler(s), Organization(s):	Professor D.B.Spalding, CHAM Ltd, 40 High Street, Wimbledon, London SW19 5AU, UK.
User's Guide:	For user manual see http://www.cham.co.uk/phoenics/d_polis/ d_docs/tr326/tr326top.htm. For an overview of PHOENICS see http://www.cham.co.uk/phoenics/d_polis/d_info/ phover.htm
Technical References:	For PHOENICS Encyclopaedia, see http://www.cham.co.uk/ phoenics/d_polis/d_enc/encindex.htm. For Lecture material, see http://www.cham.co.uk/phoenics/d_polis/d_lecs/ leclist.htm.
Validation References:	For publications list see http://www.cham.co.uk/website/new/ support/publish.htm and also http://www.simuserve.com/cfd-shop/journal.htm. For on-line application examples which includes validation examples, see http://www.cham.co.uk/ phoenics/d_polis/d_applic/applic.htm.

Availability:	PHOENICS can be obtained directly from CHAM (see http://www.cham.co.uk/phoenics/d_polis/d_info/phover.htm #licence), or from one of its agents and distributors (see http://www.cham.co.uk/phoenics/d_polis/d_info/phover.htm #agent). For further information, see also http://www.cham.co.uk/website/new/mes2sals.htm.
Price:	Academic, Commercial and R&D licences are available whose price depends on computer platform and duration of licence. Shareware versions are available by downloading them from the Internet (see http://www.simuserve.com/cfd-shop/ shwrtop.htm).
Necessary Hardware:	DOS, WINDOWS 95, 98, NT, LINUX and UNIX platforms. Parallel versions use standard message-passing protocols (PVM or MPI) as used all major parallel platforms, and so the code can run on any parallel machine that supports PVM or MPI (see http://www.cham.co.uk/phoenics/d_polis/d_info/ phover.htm#paral2).
Computer Language:	FORTRAN/C++
Size:	250 MB of virtual memory and a minimum of 32MB RAM are required to run PHOENICS. The basic installation occupies 170 MB of hard disk.
Contact Information:	Technical inquiries: Dr Michael Malin, CHAM UK, Tel 0208 947 7651, email mrm@cham.co.uk: Sales inquiries: Mr Peter Spalding, CHAM UK, Tel: 0208 947 7651, email pls@cham.co.uk.

Detailed Description:

The major features and capabilities of PHOENICS are listed below:

- Pre- and post-processors with VR-based Graphical User Interface (GUI) for visualisation of geometry and problem settings plus interface to CAD system
- Data input via GUI and/or PIL command language.
- Steady and unsteady flow
- 1, 2 and 3 dimensional flow
- Cartesian, polar and body-fitted coordinate systems
- Complex geometry handled via body-fitted coordinates or alternatively by Cartesian cut-cell (PARSOL) method; options for multi-blocking and fine-grid embedding.
- Rotating coordinate systems

- Laminar and turbulent flow
- Parabolic, hyperbolic, elliptic and fully-developed flows
- Compressible and incompressible flow
- Subsonic, transonic and supersonic flow
- Newtonian and non-Newtonian flow
- Free, forced and mixed convection
- Single-phase, two-phase and multiphase flow
- A wide-range of turbulence models, including: Prandtl zero- and one-equation models; LVEL algebraic low-Re model; k-ε model and several variants such as RNG, Chen-Kim, Yap and two-scale split spectrum; Lam-Bremhorst and two-layer low-Re k-ε models; low-Re and high-Re forms of Wilcox-Kolmogorov k-f model; Reynolds stress and heat/scalar flux transport model; LES; and multi-fluid turbulence model.
- Two-phase Eulerian continuum, model including a wide range of interphase drag, heat and mass transfer laws and models of other interfacial processes such as virtual mass and lift.
- Lagrangian multi-phase model for particle, bubble and droplet transport in both deterministic and stochastic modes of operation
- Gaseous combustion models, including eddy-break up, eddy dissipation, fast chemistry including prescribed double-delta pdf, 7-gases equilibrium model, and multi-fluid combustion model
- Solid-particle and liquid-droplet combustion models
- Chemical kinetics with interface to the CHEMKIN chemical data base
- Thermal radiation models, including 6-flux, P-1, IMMERSOL, Rosseland-diffusion model and surface-to-surface models
- Free-surface models via Scalar-equation, Height-of Liquid and two-phase continuum models
- Porous media with provision for anisotropic resistances
- Large number of solver options and large number of numerical discretisation schemes for the representation of convection
- Parallellised version for reducing computation times
- Graphical dynamic display of monitor point values and solution residuals
- User-FORTRAN facility via PLANT and GROUND feature for interfacing with PHOENICS to specify user properties, boundary conditions and sources, solver and numerical options, input and output features, and physical models.
- Extensive library of ready-made input files for the simulation of over 1000 examples
- PHOENICS Journal in which users worldwide report their simulations including input files and FORTRAN user coding.