**ACRi** is a consulting organization providing mathematical modeling and computer analysis of environmental pollution and engineering processes involving **FLUID DYNAMICS, HEAT & MASS TRANSFER, TURBULENCE, and COMBUSTION.** **ACRi** was founded in **1979** to provide advanced technology services in the fields of mathematical modeling and computer analysis. **ACRi** has subsidiaries in **France** and **India**, and distributors in the **United Kingdom, Spain, and France**. Since its founding the firm has provided consulting services on an international basis in the various fields of its expertise to over 100 clients. The firm is committed to staying abreast of the state-of-the-art in the rapidly evolving fields of mathematical and computer modeling by in-house development and close contacts with leading universities and professional organizations around the world. **ACRi is a woman and minority owned small business under the U.S. Federal Government guidelines.**

### SOFTWARE TOOLS

- **ANSWER™** General Purpose Computational Fluid Dynamics (CFD)
- **PORFLOW™** Ground Water, Porous & Fractured media Simulator
- **TIDAL™** Oceanographic & Surface Water Simulator
- **RADM™** Atmospheric Pollution and Transport Simulator
- **acrPLOT™** Post-Processing and Graphics

### CURRENT INSTALLATIONS

- Intel Pentium
- SUN Microsystems
- Data General
- IBM/RISC6000 Systems
- CONVEX Computer
- IBM mainframes
- Hewlett Packard
- DEC VAX Systems
- CRAY Super Computers

### SPHERE OF ACTIVITY

- Fluid Dynamics
- Turbulence
- Stochastic Processes
- Oceanography
- Heat Transfer
- Combustion
- Dispersion Processes
- Atmospheric Sciences
- Mass Transfer
- Chemical Processes
- Ground and Surface Water Hydrology
- Space Sciences

### SERVICES

- Fluid dynamics of bluff & aerodynamic bodies.
- Combustion in aerospace & industrial power plants
- Thermal hydraulics of nuclear power plants
- Environmental pollution and resource management
- Modeling of large surface water bodies
- Impact of urban and industrial effluents
- Data Analysis and parameter estimation
- Modeling of flow, heat & mass transfer
- Turbulence and phenomenological models
- Stochastic modeling of transport processes
- Modeling of ground water flow Systems
- Atmospheric modeling & transport of pollutants
- Analysis of uncertainties in modeling processes
- Instrumentation for flow, heat & mass transport

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**Fluid Dynamics and Combustion:** A range of models for solution of the Navier-Stokes, the Boundary Layer and the Convective Transport equations including chemical reactions, combustion and turbulence. These include the widely used ANSWER™ model which is being used by a large number of commercial, academic and research organization in a number of countries.

**Ground Water:** A suite of versatile and tested models for practically any subsurface flow system for analysis of coupled flow, heat and mass transfer, radioactive decay, chemical reaction and phase change. These include the PORFLOW™, FRACFLOW™ and WELLFRAC™ models. The U.S. Department of Energy and other government bodies extensively use the PORFLOW™ model.

**Atmosphere:** A range of models for analysis of single stacks or multiple sources, regional air bodies with complex terrain and variable meteorology. These include the highly successful RADM™ model which is one of the 6 non-guidelines models reviewed by U.S. Environmental Protection Agency (EPA) for license applications.

**Surface and Marine Waters:** A wide range of tested models for analysis of large scale water bodies including TIDAL™ and nuPLUME™ models. The TIDAL™ model is being used by a large number of commercial, academic and research organizations in a number of countries.
SELECTED CLIENTS

ACRI, S.A., Sophia Antipolis, France
AECL, Pinawa, Canada
Agabian Associates, El Segundo, CA
Alaskan NW Pipeline Co., Salt Lake City, UT
Allison Gas Turbines, Indianapolis, IN
AMFELS, Inc., Houston, TX
ANDRA, Chatenay Malabry, Paris, France
A.T. & E. Consultants, Lakeland, FL
American Petroleum Institute, Washington, DC
Applied Mechanics, Inc., Denver, CO
ARSCIMED, Paris, France
ASD GmbH, Unterschlesseheim, GERMANY
Asociacion Nuclear Vandellos, Barcelona, Spain
Battle Pacific Northwest Lab., Richland, WA
BAe-SEMA PLC, London, U.K.
Bechtel Hanford Company, Richland, WA
Black & Veatch, Tacoma, WA
British Nuclear Fuels Limited, Risley, U.K.
British Petroleum Company, PLC, Pinawa, Canada
CALTECH, Pasadena, CA
CEA, Fontenay-aux-Roses, Paris, France
Colorado State University, Denver, CO
Converse Consultants, Seattle, Washington
CSAR Corporation, Chatsworth, CA
CW Communications, Boston, MA
Dames and Moore, Los Angeles, CA
Daniel B. Stephens & Asso., Albuquerque, NM
Desert Research Institute, Reno, NV
Dragun Corporation, Framingham Hills, MI
Earth Technology Corporation, Long Beach, CA
ECN, Patten, Netherlands
Electric Power Research Institute, Palo Alto, CA
Electro Magnetic Processes, Chatsworth, CA
ENSR Consulting, Camarillo, California
Envirn’1 Benchmark Corp, Albuquerque, NM
Exxon Production Research Co., Houston, TX
Failure Analysis Associates, Palo Alto, CA
Fluor Corporation, Irvine, CA
Fluor Daniel, Inc., Greenville, SC
Garrett Turbine Engine Company, Phoenix, AZ
GATX Tank Erection Corporation, Chicago, IL
Gaz de France, Paris, France
General Electric Aircraft Engines, Cincinnati, OH
General Electric Company, Cleveland, OH
Geostock, Rueil-Malmaison, France
Geraghty & Miller, Inc., Minneapolis, MN
G.I.E. Hyperspace, Suresnes, France
Golden Associates, Inc., Redmond, WA
Gov. of Sweden, Stockholm, Sweden
GRAM, Inc., Albuquerque, NM
INESL, Idaho Falls, ID

Indian Institute of Technology, Delhi, India
Indiana University, Bloomington, IN
Ingenieros Civiles Consultores, Santiago, Chile
Institute "Josef Stefan", Ljubljana, Slovenia
Ins. de Mecanique des Fluides, Toulouse, France
Ins. Pesquisas Ener. Nucleares, Sao Paulo, BRAZIL
Intellisoft, Cupertino, CA
Intera Environmental, Inc, San Antonio, TX
IBM, Boca Raton, FL
Irvin Industries, Inc., Gardena, CA
Jacobs Engineering, Pasadena, CA
James M. Montgomery, Pasadena, CA
Johnson & Johnson, New Brunswick, NJ
JFT Agapito & Associates, Grand Junction, CO
Keramont, Tucson, AZ
Korea Atomic Energy Res., Tae Jeon, Korea
Lam Research Corporation, Fremont, CA
Lockheed Idaho Tech. Co, Idaho Falls, ID
Marquardt Company, Van Nuys, CA
Martin Marietta, Oak Ridge, TN
MBC Applied Environ’l Sci., Costa Mesa, CA.
Miskolci Egyetem, University, Miskolc, Hungary
MSE, Inc., Butte, MT
National Academy of Sciences, Washington, DC
National Aeronautical Lab., Bangalore, India
National Center for HPC, Taiwan, ROC
National Chung Hsing Univ., Taichung, Taiwan
NASA, Lewis, WA; Ames, CA
National Energy Software Center, Argonne, IL
New Environmental Engg., Inc., San Pedro, CA
North Carolina A&T State Univ., Greensboro, NC.
Northern Technical Services, Anchorage, AK
NORTHROP, Pico Riviera, California
NUS Corporation, Cleawater, FL
Oak Ridge National Lab., Grand Junction, CO
Ohio University, Athens, OH
Ontario Hydro, Toronto, Canada
Pacific Groundwater Group, Seattle, Washington
Perera & Associates, Los Angeles, CA
Pilkinson Brothers Ltd., Lathom, U.K.
PPG Industries, Inc., Lexington, North Carolina
Principe, Madrid, Spain
Principia Mechanica Limited, London, U.K.
Principia Recherche Dev. S.A., Nice, France
Pyrobay, Castro Valley, CA
Raven Ridge Resources, Grand Junction, CO
RE/SPEC Inc., Albuquerque, NM
R.M. Noble & Associates, Malibu, CA
Rockwell International, Hanford, WA
SELECTED CLIENTS

Rolls-Royce (BED) Ltd., England
Roy F. Weston, Washington, D.C.
SAIC, International, La Jolla, CA
Samsung Electronics Co, Suwon City, Korea
Sandia National Laboratory, Albuquerque, NM
SCK-CEN, Mol, Belgium
SIEMENS, Regensburg, Germany
SSES, Minneapolis, MN
Shell Development Company, Houston, TX
Sohio Petroleum Company, Dallas, TX
Southwest Research Institute, San Antonio, TX
Stetson-Harza, Utica, NY
Technical Univ. Budapest, Bertalan Lajos, Hungary
Tecnoambiente, Barcelona, Spain
TRW Environmental Safety Systems, Vienna, VA
Union Fenosa Ingenieria, S.A., Madrid, Spain
University of Adelaide, Adelaide, Australia
University of Arizona, Tucson, AZ
University of California, Berkeley, CA
University of California, Los Angeles, CA
University of Delaware, Delaware
Universite du Havre, Havre, France

University of Ljubljana, Ljubljana, Slovenia
University of Karlsruhe, Karlsruhe, W.Germany
University of Missouri, Independence, MO
University of Texas, El Paso, TX
University of Utah, Salt Lake City, UT
University of Washington, Seattle, WA
US Air Force, Minot AFB, ND
U.S. Army, Seattle, WA,
U.S. Army, Vicksburg, MS
U.S. Army, Walla Walla, WA
U.S. Department of Energy, Washington, DC
U.S. Geological Survey, Denver, CO
U.S. Geological Survey, Tacoma, WA
U.S.Minerals Managem’t Service, Los Angeles, CA
U.S. NRC, Washington, D.C.
U.S. Salinity Lab, Dept of Agr., Riverside, CA
Velorem, France
Watkins-Johnson, Scotts Valley, CA
Washington State University, Tri-cites, WA
Westinghouse Hanford Company, Richland, WA
Westinghouse Savannah River Co, Aiken, SC
Woodward-Clyde, San Francisco, CA
Yard, PLC, London, U.K. November 20,
Porflow™

**Key Words**
Computational Fluid Dynamics; Porous Media Flow; Fracture Flow; Unsaturated flow; Multi-phase flow; Ground Water; Hydrology; Ground Water Pollution; Hazardous Waste; Permafrost Thawing/Freezing; Reservoir Engineering; Aquifer management; Heat transfer; Multi-Species Mass Transfer; Salinity Transport; Fluidized Beds.

**Description**
Porflow™ is a comprehensive, general-purpose software tool for simulation of transient or steady state fluid flow, heat, salinity and mass transport in multi-phase, variably saturated, porous or fractured media with dynamic phase change. The geometry may be structured or unstructured, 2D or 3D, Cartesian or Cylindrical. The porous/fractured media may be anisotropic and heterogeneous, arbitrary sources (injection or pumping wells) may be present and, chemical reactions or radioactive decay may take place. It accommodates alternate fluid and media property relations and complex and arbitrary boundary conditions.

It is a highly modular software tool that has been applied to a wide range of practical problems in petrochemical, hydrological, geological, nuclear, and chemical industry applications. Typical industry applications have included ground water pollution and resource management, disposal and management of hazardous wastes, environmental impact of hot or cold buried pipes, thawing/freezing of permafrost in terrestrial or marine environment, flow in porous beds, formation of geologic basins, and reservoir engineering problems.

The user interface is through the conversational Freeform™ language that provides for simple English-like command syntax. A GUI interface option is also available. The results can be graphically displayed by the AcrlPlot™ post-processor, which can generate charts of flow vectors, contours, grids, 3D surface plots and X-Y plots at any cross section. Porflow™ is written in FORTRAN programming language.

**Hardware**
Any computer system from IBM-PC to Supercomputers.

**Price**
$995 to $15,000; based on system configuration

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KEYWORDS  
Computational Fluid Dynamics; Heat Transfer; Multi-Species Mass Transfer; Chemical Reaction; Convection; Turbulence; Laminar Flow; Combustion; Radiation; Conjugate Heat Transfer, Flow in Complex Geometries; Internal Flow; External Flow; Navier-Stokes Equations; Transport Equations.

DESCRIPTION  
ANSWER™ is a comprehensive mathematical model for simulation of laminar or turbulent, compressible or incompressible, fluid flow, heat and mass transfer with or without swirl, chemical reactions and combustion. Arbitrary structured or unstructured, 2D or 3D, Cartesian or Cylindrical geometry, with or without internal obstacles is accommodated. Single or multiple inlets, outlets, sources and free surfaces may be present.

It is a highly modular software tool, which is suitable for a wide range of practical fluid flow problems in aerospace, mechanical, chemical, electronic, automobile, petrochemical, and civil engineering applications. Internal flow applications have included combustors, reactors, process chambers, automobiles, pipes and engineering components. External flow applications have included aerospace vehicles, submarines, automobiles, and the oceanic and atmospheric environments.

The user interface is through the conversational FREEFORM™ language that provides for simple English-like command syntax. A GUI interface option is also available. The results can be graphically displayed by the acrPLOT™ post-processor, which can generate charts of flow vectors, contours, grids, 3D surface plots and X-Y plots at any cross section. PORFLOW™ is written in FORTRAN programming language.

HARDWARE  
Any computer system from IBM-PC to Supercomputers.

PRICE  
$ 995 to $ 15,000; based on system configuration

CONTACT  
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**KEYWORDS**
Computational Fluid Dynamics; Random Walk Model; Lagrangian Model; Particle Transport; Stochastic Transport; Air Pollution; Diffusion; Dispersion; Turbulent Transport; Complex Terrain; Short Range Transport; Long Range Transport; Single or Multiple Sources; Moving sources; Area Sources.

**DESCRIPTION**
RADM is a Random-Walk model for simulation of dispersion processes in turbulent fluids. In particular it has been successfully used for air pollution studies. It employs a stochastic approach to solve the governing transport equations for motion of an inert or reactive species. It allows for arbitrary fluid and particle velocity to be superimposed on a random (or turbulent) motion of particles. The particles may undergo chemical reaction, radioactive decay, settling and drag. Arbitrary complex terrain, arbitrary wind fields and inversion conditions are accommodated. Single or multiple fixed, mobile or area sources may be present. Its primary applications are in air pollution though any dispersion process may be simulated. Typical petrochemical applications include those of air pollution from refinery stacks and effluent discharges.

The user interface is through the conversational FREEFORM language which provides for simple english-like command syntax. The results can be graphically displayed by the acrPLOT post-processor, which can generate charts of flow vectors, contours, grids, 3D surface plots and X-Y plots at any cross section.

RADM is written in FORTRAN-77 programming language.

**HARDWARE**
Any computer system from IBM-PC to Supercomputers.

**PRICE**
$ 995 to $ 15,000; based on system configuration

**CONTACT**
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KEYWORDS  General Purpose Plotting; Scientific & Engineering Plotting; Graphic Display; XY Plots; Vector Plots; Raster Plots; Contour Plots; 3D Plots; Isometric Plots; Perspective Plots; Pre-Processing Software; Post-Processing Software.

DESCRIPTION  ACRPLOT is a general purpose graphics program used in engineering and scientific plotting applications. It can generate XY, vector, contour, raster, and 3D perspective and isometric charts from given data. It also acts as a post-processor for other engineering & scientific software packages (PORFLOW, ANSWER, RADM, WELLFRAC, others) marketed by ACRi.

ACRPLOT provides for a wide range of graphic display devices; these include CRT devices, printers and plotters. However, if plotting is done on a device which is not in ACRPLOT library then CALCOMP-compatible PLOT, PLOTS, PEN and SYMBOL subroutines must be available on the operating system.

ACRPLOT user interface is through a conversational FREEFORM language which provides for simple english-like command syntax.

ACRPLOT provides for a wide range of graphic display devices; these include CRT devices, printers and plotters. However, if plotting is done on a device which is not in ACRPLOT library then CALCOMP-compatible PLOT, PLOTS, PEN and SYMBOL subroutines must be available on the operating system.

HARDWARE  Any computer system from IBM-PC to Supercomputers.

PRICE  $ 795 to $ 12,000; based on system configuration

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**KEYWORDS**

Computational Fluid Dynamics; Surface water flow; Large water bodies; Shallow water equations; Water pollution; Water quality; Effluents; Environmental impact; Water resource management; Heat transfer; Mass transfer; Salinity transport.

**DESCRIPTION**

TIDAL software package simulates the hydrodynamics and water quality behavior of large scale water bodies such as bays, estuaries, rivers, lakes and coastal waters. It incorporates the effects of a number of important physical processes on the water body; these include currents, tides, winds, gravitational and coriolis forces, bathymetry, friction, sources and sinks, and chemical reactions. TIDAL also provides for dynamic flooding and draining of coastal lowlands.

It is a highly modular program which has been applied to a wide range of practical problems in water resource management, urban and industrial planning, disposal and management of urban and industrial wastes, environmental impact and, pollution management and compliance.

The user interface is through the conversational FREEFORM language which provides for simple english-like command syntax. The results can be graphically displayed by the acrPLOT post-processor, which can generate charts of flow vectors, contours, grids, 3D surface plots and X-Y plots at any cross section.

TIDAL is written in FORTRAN-77 programming language.

**HARDWARE**

Any computer system from IBM-PC to Supercomputers.

**PRICE**

$ 995 to $ 15,000; based on system configuration

**CONTACT**

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pb@acri.fr
KEYWORDS

Environmental pollution; Environmental impact; Effluent; Water pollution; Water quality; Air quality; Plumes.

DESCRIPTION

PLUME/NEWJET/DRIFT is a suite of computer models which can be used to analyze the transport and fate of effluents in the environment. These models are based on analytic solutions to the governing equations. They can predict the fate of effluent in the ground or surface water bodies, or in the atmosphere. The effluents which can be predicted include thermal discharges, chemicals or hazardous waste, sewage, drilling muds, cuttings and a range of other industrial pollutants.

These computer programs have been applied to a wide range of practical problems in the disposal and management of urban and industrial wastes, environmental impact and, pollution management and compliance.

These models are written in FORTRAN-77 programming language.

HARDWARE

Any computer system from IBM-PC to Supercomputers.

PRICE

$995 to $5,000; based on system configuration

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