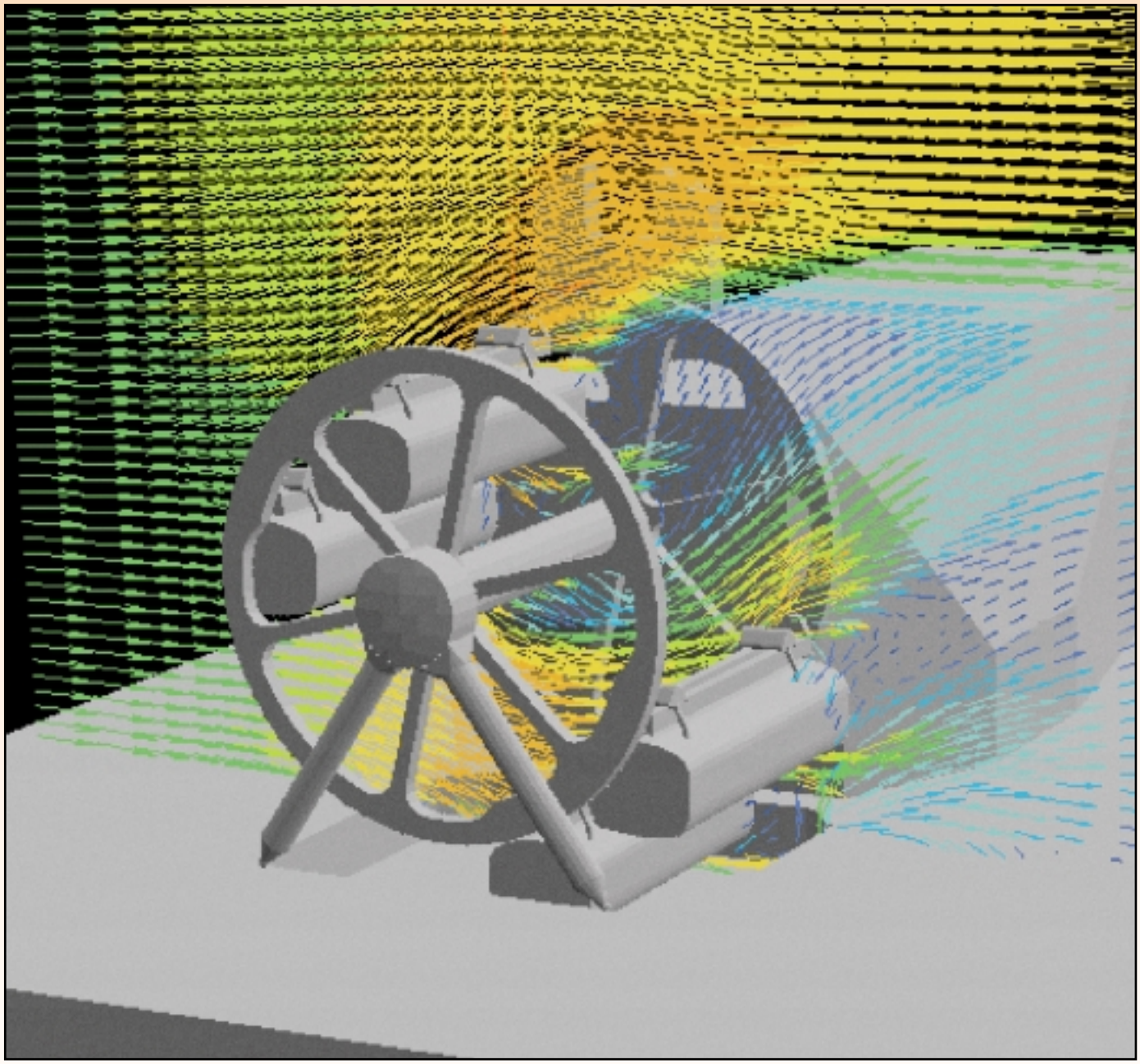
PHOENICS news

CHAM

Autumn 2000



NEWS FROM THE WORLD OF COMPUTATIONAL FLUID DYNAMICS

PHOENICS News

Designed & Edited by Peter Spalding
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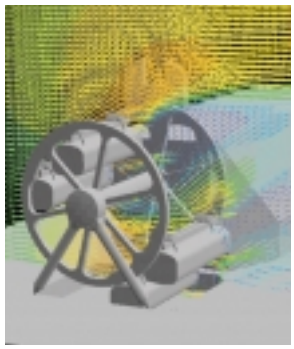
Contents



Above & Front Cover:
Velocity vectors of air flow over Millennium Boat Wheel
see page 4

Pictures courtesy of Kenneth Grubb Associates, UK.

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CHAM's internet cfdShop & Simuserve Services open

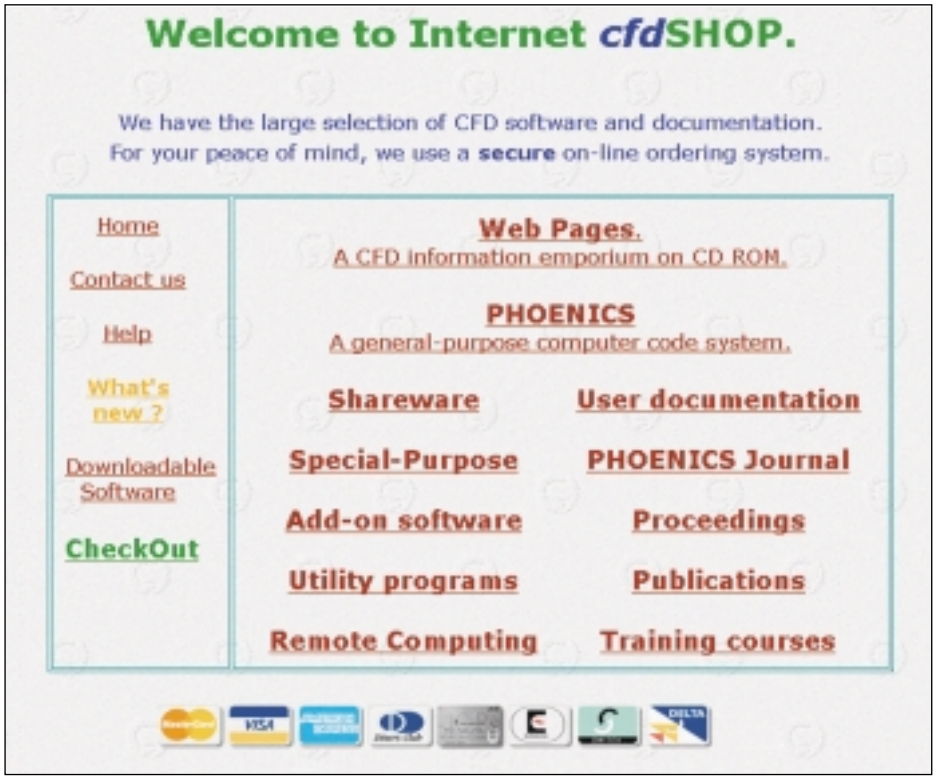
On-Line Shopping and On-line Computing

PHOENICS Shareware has been available for customers to download for sometime. The success of the download service has prompted CHAM to open a dedicated internet cfdShop for several other of its CFD products and services.

CHAM's cfdShop carries a large selection of PHOENICS-based CFD software and related documents. You can order a variety of special-purpose software and of course all levels of shareware, supplied on CD. The cfdShop site utilises a secure On-Line credit clearance system for order processing.

The cfdShop can be accessed from the homepage of CHAM's web site or directly via (www.simuserve.com/cfd-shop)

For more information or questions about the products available via CHAM's cfdShop, contact Mrs Petula Smith, email: ps@cham.co.uk



In addition to the cfdShop, the Simuserve Remote Computing Service has commenced. The technology of RCS is backed up by the EU project, "ADELFI".

Utilising dedicated CHAM "in-house" systems, users can gain access to PHOENICS via the web.
Once registered, users wishing to evaluate this service can download the PHOENICS graphical user interface for pre- and post-processing. Running library cases is free-of-charge.

Customers can run as many of their own cases as they like for a monthly flat rate fee - presently only £100 without on-line technical support, or £500 with unlimited on-line technical support.

Access the Simuserve Remote Computing service directly via:

www.simuserve.com/cfd-shop/rcstop.htm

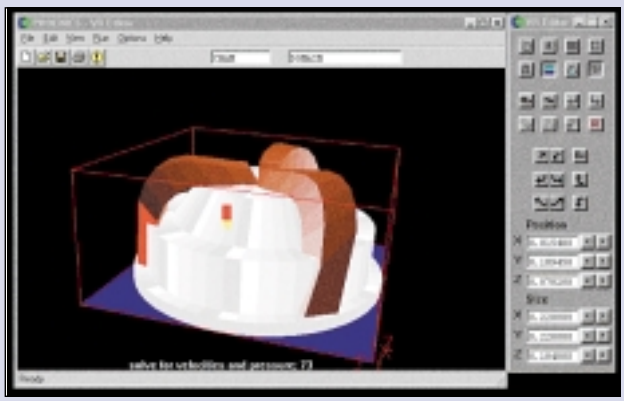
Simuserve Remote Computing Service

This service is free of charge; but it operates only if users first register and, in doing so, provide themselves with a user name and password.
If you have already registered, you may now log on here.

logon

Otherwise, if you wish to register, or to have more information, please click here.

PHOENICS Downloadable PVR Interface



Flow around a drill bit

Once you have registered, you are invited to download a **free** copy of the PHOENICS User Interface, which uses the Simuserve Remote Computing Service to perform the calculations.

Embedded 3rd Party Software for PHOENICS

Peter Spalding outlines What's *EXTRA* in PHOENICS-3.4

The January 2000 issue of the PHOENICS Newsletter announced new 3rd party software, such as the GeoGrid-CSI BFC mesh generation package from Computational Sciences Inc, and the CADfix-Lite automatic CAD data conversion utility from FEGS Ltd. These packages are available as add-ons to the PHOENICS-3.2 and 3.3 releases. For PHOENICS-3.4, we have adopted a "Try-Before-You-Buy" policy to provide an opportunity for users to evaluate their benefits.

Provision has been made within the Menu for PHOENICS-3.4 to gain access to not only GeoGrid-CSI and CADfix-Lite, but also additional third party products. These include the MIGAL multi-grid solver described in the centre pages, plus some alternative post-processing packages, namely S-PHOTON, now developed by SL-Glas GmbH and TECPLOT-8.0 from Amtec Inc.

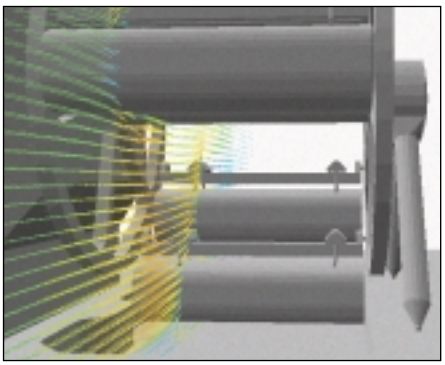
CADfix-Lite (solely available for PHOENICS) has been extended from IGES-to-STL format only, to include automatic repair and conversion into STL from ISTEP, AcisSAT and even a straightforward STL-to-STL repair feature. Please note, though, that CADfix is designed for Windows-NT and UNIX systems.

All of the above will be supplied together with PHOENICS-3.4 with a 2-month unrestricted-use unlocking string. Thereafter, users can register with CHAM and obtain further unlocking strings for annual or perpetual licence usage, as desired.

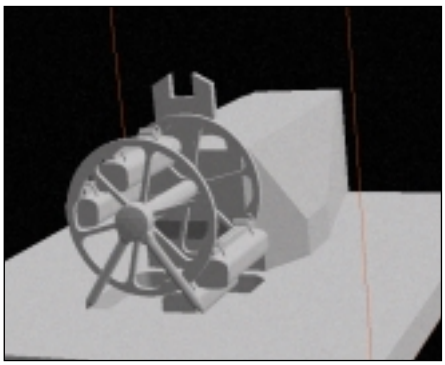
Full product descriptions can be found on the appropriate supplier web site or via CHAM's own web pages, as follows: www.simuserve.com/cfd-shop/addontop.htm

Millennium Boat Wheel

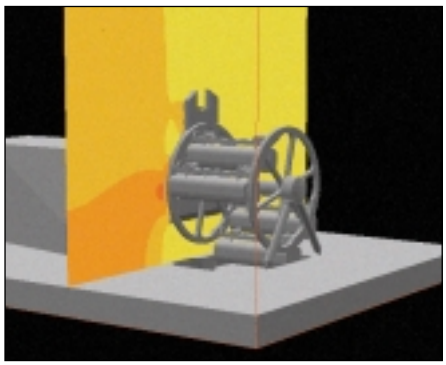
Russ Digby reports on design considerations for wind loading using PHOENICS simulations



Velocity vectors over gondolas



Geometry of Millennium Boatlift Wheel viewed in VR



Pressure contours near wheel rim

One of the many projects generated in connection with the new Millennium is the proposed Millennium Boatlift Wheel, designed to transfer boats between the Forth & Clyde Canal and the Union Canal near Falkirk in Scotland.

This is part of the Millennium Link Project, sponsored by British Waterways Scotland. Funding will come from the Millennium Commission, Strathclyde European Partnership, East of Scotland European Project and seven local authorities; the total cost will be in excess of £78 million.

Project engineering is in the hands of Binnie Black and Veach, in association with Kenneth Grubb Associates Ltd, who are the structural engineers for the wheel exemplar design.

The wheel will transfer vessels between a holding bay in the lower canal and an aqueduct, about 27 metres higher, linking to the higher canal. Four fully-enclosed gondolas, arranged as shown in two balanced pairs, will be used to move the boats.

The wheel will be in an exposed site, and is very large; wind effects are therefore a very important consideration. To gain an understanding of the likely wind patterns around the complicated structure, and to assess wind loading under a range of operating conditions, a combination of wind tunnel tests and PHOENICS simulations were carried out.

As a result of this combined approach the scheme design was completed with confidence by Kenneth Grubb Associates Ltd.

Russ Digby
Kenneth Grubb Associates
Email: email@kgal.demon.co.uk

Applications of PHOENICS at Scetauroute

Dr Jalil Ouazzani of Arcofluid reports

The French Company Scetauroute is one of the world's leading companies in tunnel design and construction. The company has been using the PHOENICS code for several years.

The Fluid Research Group at Scetauroute, lead by Dr Eric Casale, has tackled very large and complex simulations of fires in tunnels as well as many other situations such as pollution dispersion of building aeraulic perturbations.

Scetauroute was involved in the Gothard Base Tunnel project in Switzerland. The fluid mechanics group modelled a fire occurring in a train located inside an emergency underground station.
The model was transient, 3D, and based on the Simple Chemical Reaction System (SCRS) and Eddy break-up approaches.
It uses both BFC and VR representation. The purpose of the model was to achieve accurate dimensioning of the ventilation system, and especially the smoke extraction system. An important phenomenon of forced stratification induced by transverse fresh air jets was predicted by the model. (Figure 1).

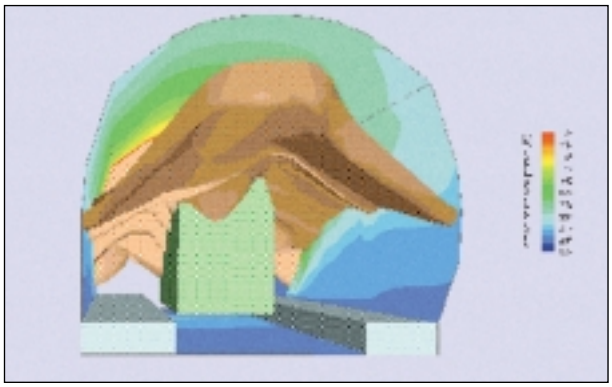


Figure 1: View of the smoke development in the vicinity of the train

The Scetauroute company has also modelled the heat transfer and ventilation in the public parking complex close to the city hall of Annecy, France (the Scetauroute Tunneling Department is situated in Annecy). This construction is a circular underground building with 6 floors providing parking spaces. A main feature of this car park is the helicoidal runway (Figure 2). The model had to take into account both natural and forced convection, a fire heat source, ramps, vehicles, stairways and the ventilation ducts (Figure 3). The modelling task via BFC grids was considered to be impractical. Therefore, VR objects were chosen, and all the objects reproduced by this technique.

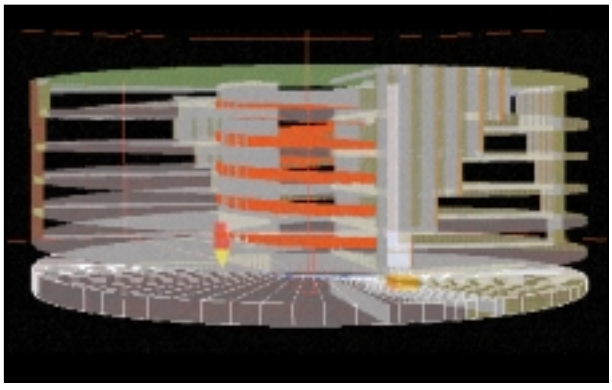


Figure 2: VR view of the Annecy city hall parking structure

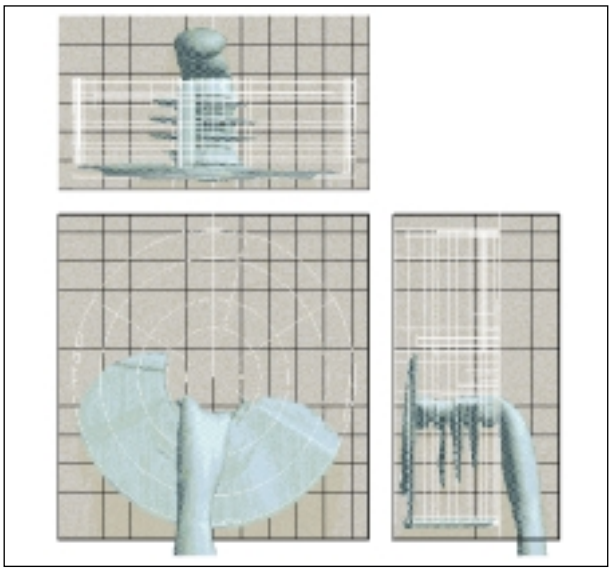


Figure 3: View of the smoke development in the case of a car fire at the lowest level of the parking

In conjunction with the fluid mechanics group at the University of Marseille (Dr Patrick Bontoux and Dr Bernard Eugene Forestier) and with the help of ArcoFluid (Dr Jalil Ouazzani), Scetauroute supported an academic research programme for fire and ventilation in tunnels. This joint effort has led to the PhD thesis of Mrs H Cordier ("Numerical modelling of fires in tunnels") and to the ongoing PhD thesis of Mr G Auguin ("Analysis of full scale tests and numerical modelling of fires in tunnels").
The PHOENICS code was used extensively for both projects.

Other uses of the PHOENICS code by the Scetauroute Company concern air pollution. A large simulation of smoke exhausted from two chimneys has been conducted for two sites in the city of Cairo (Egypt) in collaboration with Arcofluid. Houses and buildings were represented using VR objects. Several wind directions and chimney heights were simulated (Figure 4).

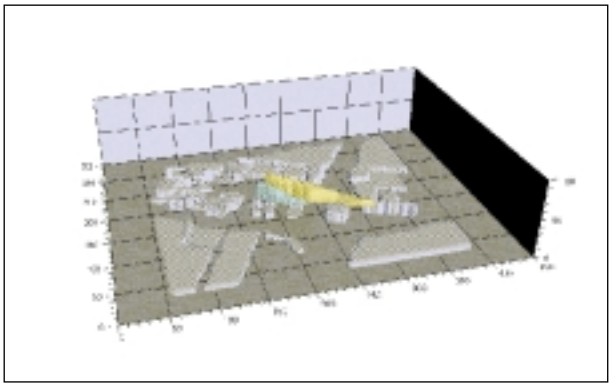


Figure 4: NO2 plumes exhausted by two chimneys in Cairo

Scetauroute also used PHOENICS in other areas, such as the evaluation of the ventilation effects in tunnels (use of jet fans) or the location optimization of the new heliport of Monaco regarding the effects of turbulence induced by neighbouring buildings. For more information, please contact:

Dr Eric Casalé, Email: e.casale@scetauroute.fr

or Dr H Biollay, Email: h.biollay@scetauroute.fr

MIGAL - Boosting CFD

Dramatic improvements to convergence times for PHOENICS-3.3.1

Introduction

A new multi-grid solver has been announced, which radically reduces the calculation time to produced converged results for a variety of cases. The "MIGAL" solver, developed by Dr Michel Ferry of MFRDC, France, is supplied with PHOENICS-3.3.1 as a "switch-on" option.

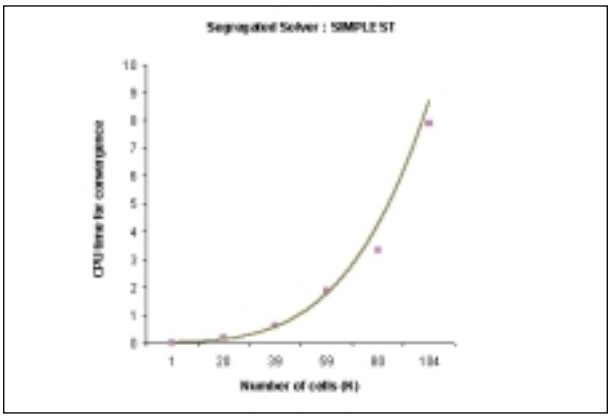
MIGAL is a coupled algebraic multi-grid solver which employs a strong velocity-pressure coupling technique and a multi-grid approach. MIGAL produces great robustness and large speed-up for many flow types.

Save hours

So, why wait hours and hours when your computer can give you the same solution within minutes? Why pay for high-cost parallel computers or PC-clusters when you can speed-up your own PC by 5, 10 or 30 times just using software? Why prevent yourself from having more runs to confirm your simulations with grids, models and schemes dependency tests?

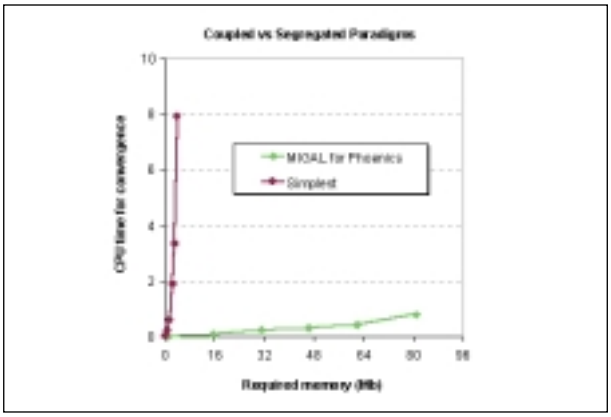
Change of Paradigm

Because the memory was extremely limited and expensive in the early developments of computational fluid dynamics (CFD), only algorithms with small demands on computing power could survive. In this context, the best strategy was the Patankar-Spalding SIMPLE algorithm that segregates the momentum and continuity equations, in spite of a well-known poor convergence as the number of cells increases.



Segregated Solver: SIMPLEST

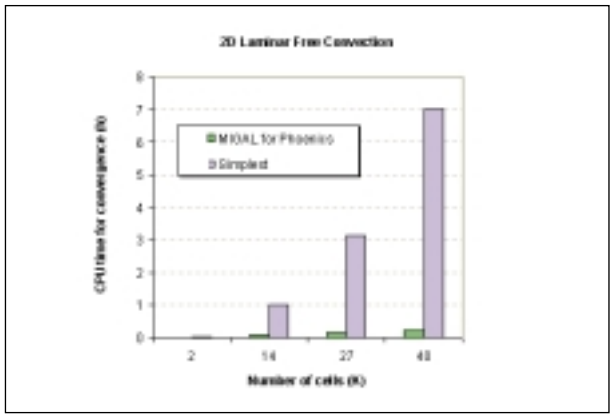
Today, industrial CFD stands at the crossroads. The mean amount of affordable memory on workstations allows fine grids but the resulting time for convergence becomes excessive. This opens the door to other ways of thinking. Couldn't we compute faster using that under-employed memory? This is precisely the idea of MIGAL; the new coupled algebraic multi-grid solver that will boost your PHOENICS applications.



Coupled vs Segregated Paradigms

Speed-up

Due to its strong velocity-pressure coupling technique and its multi-grid approach MIGAL produces great robustness and large speed-up for many flows. As shown below, when plugged into PHOENICS, MIGAL impressively reduces the elapsed time for convergence both for two-dimensional and three-dimensional flows.



2D Laminar Free Convection

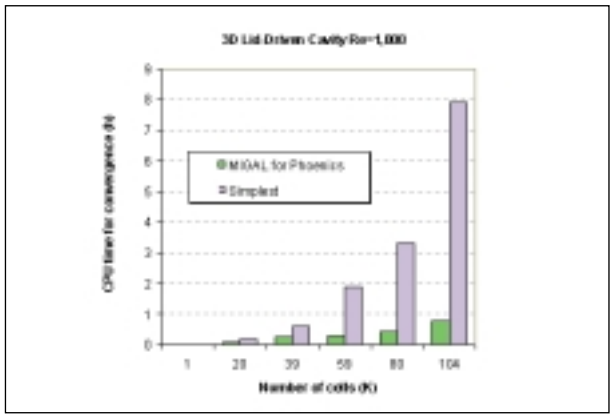
Memory requirement

Of course such a speed-up has a cost. The storage of the coefficients of the coupled equations and the additional storage for the multi-grid procedure increase the minimum amount of memory. The additional memory required for MIGAL can be approximated by the following rules in Mb/Cell :

2D -> 4.E-4 Mb/Cell

3D -> 7.E-4 Mb/Cell

So that for 3D Cartesian grids, the required memory to run PHOENICS with MIGAL is little less than 1Mb for 1,000 cells.



3D Lid-Driven Cavity Re=1,000

Roadmap

During the 1990's coupled solvers were not suited to 3D problems owing to their memory requirement. For instance, the 8Mb RAM of an average PC in 1991, restricted to 8,000 cells the maximum size of 3D problems that could be solved. Nevertheless, because of constant improvements in computer technology, both the processor's power and the mean amount of memory of workstations have been increased by a factor of 4 every 3 years during the last decade. Consequently, a very affordable PC nowadays can readily solve a 640,000 cell 3D problem in 90 minutes using MIGAL, instead of 90 hours using the traditional SIMPLEST segregated solver.

MIGAL - Boosting CFD

Dramatic improvements to convergence times for PHOENICS-3.3.1

	1991	1994	1997	2000	2003
Mean RAM size	8Mb	32Mb	128Mb	512Mb	2Gb
Maximum size (cells)	8K	40K	160K	640K	2.5M
CPU time with MIGAL	1h30	1h30	1h30	1h30	>2h
CPU time with SIMPLEST	2h	6h	21h	>90h	>500h

MIGAL's roadmap for the 3D Lid-Driven Cavity Flow (Re=1,000)

Acknowlegment

MIGAL is a product of MFRDC (www.mfrdc.com) which has been continually improved over several years to become a robust software able to handle industrial flows.

Pricing

MIGAL is available as an Add-On within PHOENICS-3.3.1. Annual licence fees for this alternative solver start from £500 for academic institutions and £2,000 for commercial customers, including maintenance fee. For further information contact Peter Spalding at CHAM (pls@cham.co.uk).

Coming Soon...

"IN-FORM"

Already partially-implemented in PHOENICS-3.3, and being extended month-by-month, is IN-FORM, the INput of FORMulae extension to the PHOENICS Input Language.

For many years, PLANT has enabled users to place formulae in Q1 files, whereupon the Satellite module has written an appropriate GROUND subroutine in FORTRAN and the system has automatically compiled, linked and built the EARTH module.

IN-FORM will have the same effect, but without the FORTRAN, compilation or re-linking.

Moreover, IN-FORM will replace and extend the easy-to-forget built-in GROUND options for:

- **material properties,**
- **boundary conditions,**
- **sources and sinks,**
- **initial values,**
- **body shapes.**

For example, all that the user will have to do is insert in the Q1 file lines such as:

SPEDAT (PROPERTY, CFIPS, C,=150.0*VREL*ENUL/DIAM)

SPEDAT (PROPERTY, ENUL, C, =1.E-5*TEM1**0.65)

These lines are transmitted to EARTH via EARDAT, and are there appropriately interpreted.

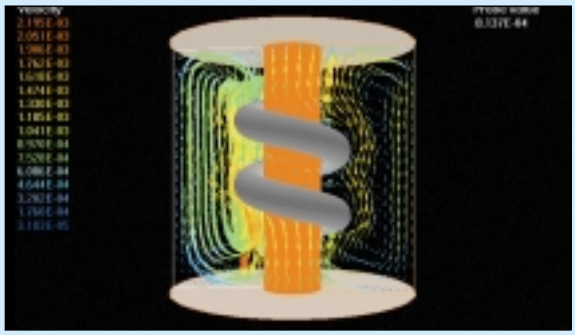
When fully implemented, IN-FORM will have:-

- **immensely extended the PHOENICS problem-solving capabilities;**
- **made the data-input procedures easier to implement;**
- **reduced the turn-round time; and made the output easier to read and interpret.**

Further information about the progress of this development can be sought from Professor D Brian Spalding, email: dbs@cham.co.uk

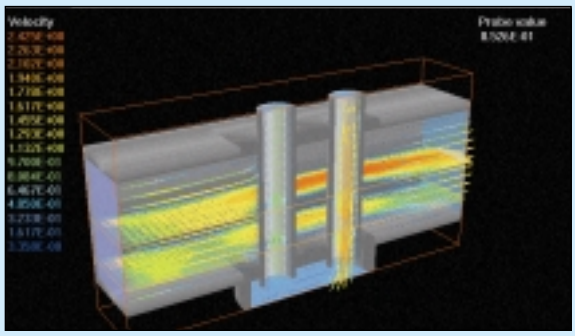
VRGEOM Utility

A menu-driven utility for creating GEOMetry files which can be interpreted as VR objects.



Natural Convection around a cylinder with attached spiral coil

VRGEOM is designed to provide a user-friendly tool for creating objects participating in fluid-thermal simulations. VRGEOM handles a number of basic object classes from which a variety of different shapes can be created via user-specified object parameters. At present, 26 classes of basic objects have been made available for Cartesian and cylindrical polar coordinate systems.



Two-pass tube heat exchanger

VRGEOM can also convert XYZ files, such as PHOENICS uses for describing BFC grids and geometries, into the files which are interpreted as specific objects.

Users can adjust the basic object parameters to get object variants. Once created these objects can be loaded into the VR editor, dimensioned, oriented and combined to obtain the desired geometry.

Click on www.simuserve.com/cfd-shop/utilitis.htm for the full description of VRGEOM and other add-on utilities. Dr Sergei V Zhubrin, email: svz@cham.co.uk

3D PHOENICS Simulations Aid in Nuclear Safety Assessments

Dr Mingwang An reports nuclear safety analysis using PHOENICS-3.3

Designers and regulators of commercial nuclear power installations often use test facilities to assess the expected safety performance of such installations.

In many thermalhydraulic safety applications, one-dimensional computer programs are used to help in the understanding of such tests, since such programs are generally sufficiently precise, and are supported by a large body of experimental correlation.

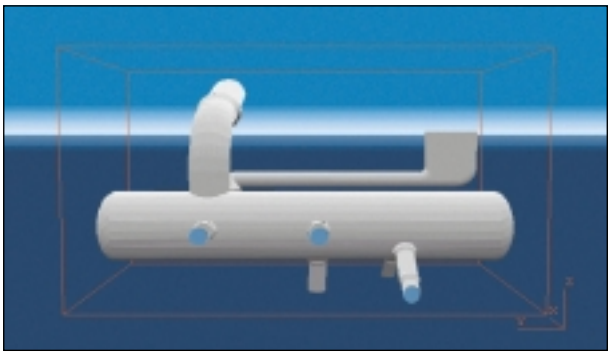


Fig. 1 - Geometry of Header and Connecting Lines

However, when complicated thermalhydraulic features are involved, for example, large volumes, or complex geometries, particularly with two-phase flows, it is necessary to invoke more fundamentally-based 3D CFD codes, such as PHOENICS.

In this application of PHOENICS, a particular section of a two-phase test facility was modelled. In this facility, five electrically-heated horizontal channels are connected to inlet and outlet headers via inlet and outlet feeders. Heat is removed from the two-phase coolant after the outlet headers, then the compressed liquid is pumped back to the inlet headers.

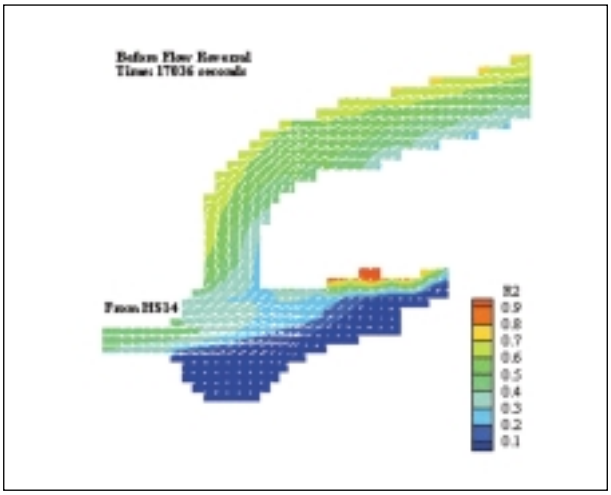


Fig. 2 - Before Flow Reversal
Time: 17036 seconds

In a thermosyphoning test using this rig, during which the normally operating circulating pump was "tripped", the normal flow direction of the coolant in two of the five heated channels, reversed, after which flow stalled entirely in one channel, and the horizontal channel heated up. Analysis of the test with a one-dimensional program indicated that one of the outlet headers may have played a significant part in these observations.

The simulation of the transient 3D two-phase flow within this latter outlet header was a pioneer application of PHOENICS to nuclear safety analysis in Canada.

Figure 1 shows the geometry of the header and connecting lines, as imported from AutoCAD to PHOENICS via an "stl" file.
The focus of this work was on examining the two-phase flow conditions within the header at the time of the unexpected observations, and assessing the part they played in either initiating or exacerbating the unexpected observations.
Isolating the importance of the header behaviour in the test rig then permitted us to make arguments as to the likelihood of similar events occurring in a full scale facility.

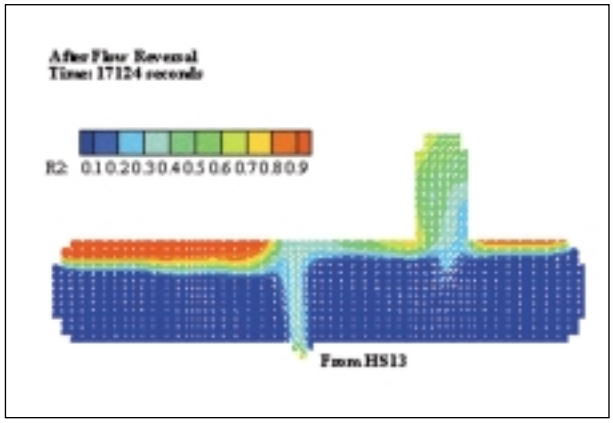


Fig. 3 - After Flow Reversal
Time: 17124 seconds

A consultant report was submitted to the client, with a detailed presentation of the work given to interested parties.

Dr Mingwang An, Atlantic Nuclear Services Limited, Canada
Email: man@ansl.ca

Discover the new PHOENICS Discussion Forum at

CFD Online

Why not exchange ideas, news, information and views via the new PHOENICS Discussion Forum set up by Dr Jonas Larsson (www.cfd-online.com/forum/phoenics.cgi)

"VICTIM" Project Under Way

Professor D Brian Spalding reports on the commencement of a new research programme

Typical Thermal and "Sweating" Manikins - pictures courtesy of DERA

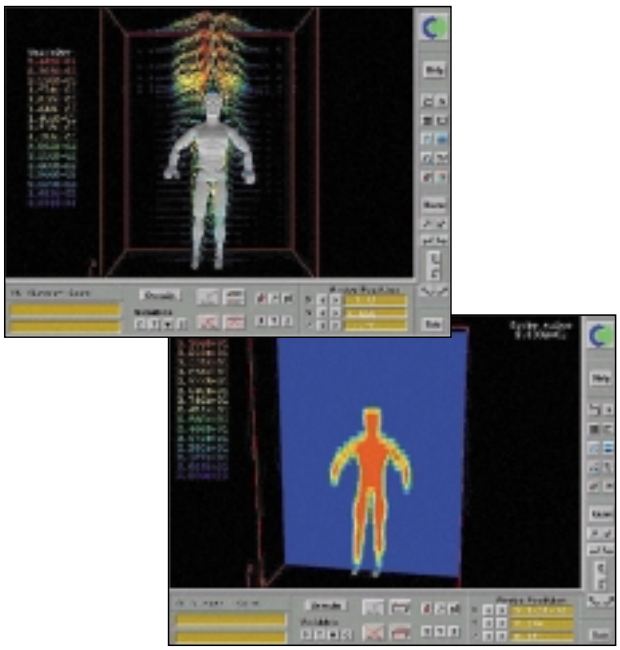
Stage 1 of a 3-year project has been awarded to CHAM by the UK's Defence Evaluation Research Agency (DERA), to construct a CFD model for specialised human environments. Entitled the Virtual Manikin Project, or VICTIM for short, the project combines CFD techniques with known physiological data. Stage 1 focuses on modelling a clothed manikin, typically used by physical modelling techniques.

PHOENICS calculates the local boundary conditions for a thermo-physiological model which, in turn, dictates the heat and mass sources (perspiration) for the CFD model. Representation of the clothing model requires the combination of a number of features within PHOENICS with pre-existing algorithms used for deformation of clothing. These features include:

- **CAD-to-CFD**
- **Moving Objects**
- **Stress-Strain and, of course…**
- **Fluid Flow**
- **Heat Transfer**

An extension to the built-in PARSOL (PArtial SOLid) feature is needed to permit multiple fluid/solid interfaces within a given computational cell, plus a unification of the treatment of fluid flow and heat transfer within the cell.

The ultimate aim of the project is to produce a stand-alone PHOENICS-based Special-Purpose Product (SPP) for modelling a moving, clothed manikin operating within a range of potentially hazardous environments. This will permit the assessment of clothing systems prior to production, and reduce costs and time-scales for MoD equipment testing and procurement.



Air movement and temperature contours - simplified demonstration case

For further information contact:

Andy Buxton, email: acbuxton@dera.gov.gb

Brian Spalding, email: dbs@cham.co.uk

PHOENICS AWARD

This year's PHOENICS prize for the best CFD project of the year at the University of Hertfordshire, has been awarded to Pierre Forté for his paper entitled "CFD Investigation into UV Disinfection". His project assessed the hydraulic efficiency of various ultraviolet disinfection systems in water treatment processes.

Runner Up was Shane Edward Clarke for his paper entitled "Flow in a Cavity". His project, in collaboration with BAe Farnborough, concerned the modelling of flow of air within a rectangular cavity.

In selecting Pierre's paper for the PHOENICS Prize, Professor D Brian Spalding commented:-

"Both authors have performed work which proves them to possess considerable skill, knowledge and energy; and their reports are both excellent in respect of content and presentation.

While the question of superiority was not easy to determine, I inclined finally to the recommendation that the prize should go the Pierre Forte.

My main reason was that, the practical purpose of the equipment being unconventional, namely ultra-violet disinfection, he had to exert the greater originality in respect of how to set up the model and how to interpret and report the results."

Congratulations should be given to both winner and runner-up. No doubt their papers will be featured in forthcoming issues of the PHOENICS Journal. Further details can be obtained from:-

Professor Arne E Holdo, CFD Group, Faculty of Engineering & Information Science, University of Hertfordshire, Hatfield, HERTS AL10 9AB.
Email: a.e.holdo@herts.ac.uk

Conference Round-Up

by Sylvie Stevens

The Millennium PHOENICS Users Conference took place earlier this year in Luxembourg. Over 90 delegates from 24 countries attended the event, enjoying a wide selection of interesting presentations from PHOENICS Users from all over the world.

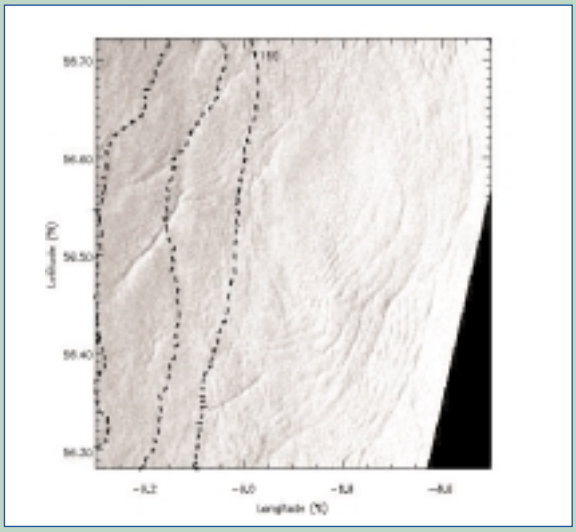
Throughout the 4-day period, participants had the opportunity to assess the latest release of PHOENICS and gain first-hand experience of the new features presented in the programme, using powerful systems provided by our sponsors Hewlett-Packard INVENT. Poster sessions and demonstrations of related third party software products were also featured in the adjacent exhibition area. The conference was complemented by the excellent service provided by both technical and catering staff of the InterContinental Hotel.

I think I can speak for all when I say that the conference was considered to be a great success. The final proceedings will become available on CD. This will be provided free to all those who attended the conference, and will be for sale to all others via CHAM's Internet cfdShop (www.simuserve.com/cfd-shop). The majority of the papers will also appear in forthcoming issues of the PHOENICS Journal.

To give you a taste of the standard of the presentations, I attach an extract from just one sample, **"PHOENICS Predictions of Large Amplitude Internal Waves in the Ocean"**, to whet your appetite for more...

PHOENICS Predictions of Large Amplitude Internal Waves in the Ocean
Dr R P Hornby and Mr R J Small, Underwater Sensors and Oceanography Department, Building B21, Winfrith Technology Centre, Winfrith Newburgh, Dorset, DT2 8XJ

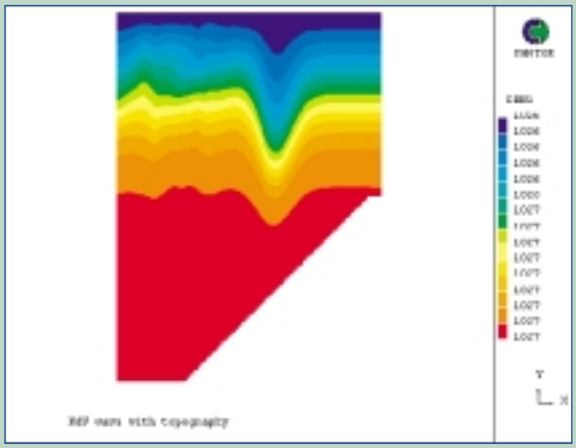
Internal waves are ubiquitous in the ocean and result from disturbances to the stable ocean stratification. Such disturbances may arise from a variety of sources including wind stress fluctuations, variation in atmospheric pressure fields, heavy rain, turbulence, wave action or flow over topography (for example tidal flows over the shelf edge in stratified waters may generate internal waves - the so called internal tides).



SAR image of the Malin Shelf

In particular, large amplitude internal waves (which may evolve into isolated waves of fixed form called solitons) are commonly produced at continental shelf breaks (and other local topographic features) by tidal forcing. These waves have amplitudes of order tens of metres and orbital velocities of order tens of cm/s and therefore significantly affect the local stratification and current shear.

Dr Bob Hornby and Mr Justin Small of the Defence Evaluation and Research Agency (DERA) have been using PHOENICS to predict the propagation and interaction of large amplitude internal waves for both military and non-military applications.



Predictions of Large Amplitude Internal Wave Propagation

Bob explains that 'these waves are important from the military point of view because they affect the propagation of sound in the surface layers of the ocean. Hence the propagation of these waves and the way that they interact with each other need to be predicted in order to make an assessment of their effect on acoustic sensors. The currents associated with large amplitude internal waves may have a dramatic effect on moored offshore platforms if their presence is not anticipated and the enhancement of local mixing due to the waves is also important in understanding the distribution of nutrients and pollutants in shelf-edge seas. Because of the inherent non-linearity, it is not possible to derive analytical solutions of general applicability and so numerical methods need to be applied. So far we are very pleased with the PHOENICS results.'

Two figures illustrating the work are shown above. The first shows a Synthetic Aperture Radar (SAR) image of the Malin Shelf (north-west coast of Ireland) taken from the European (Space Agency) Remote Sensing (ERS-1) satellite on 20th August 1995. The 'ripples' appearing in the image are surface manifestations of large amplitude internal waves moving from deep to shallow water (the dotted lines superimposed on the SAR image are lines of constant depth which from left to right are 1000m, 600m and 160m). The second figure shows a snapshot in time of PHOENICS predictions of a large amplitude internal wave propagating from deep to shallow water.

Dr R P Hornby, DERA, Email: RPHORNBY@mail.dera.gov.uk

I hope that many of you will decide to join us at the next International PHOENICS Users Conference to be held in 2002. The venue is not yet decided but "watch this space" as it will be announced in Spring of next year. For further information about the conference, or information on how to subscribe or contribute to the PHOENICS Journal, please contact Mrs S K Stevens, email: sks894460@aol.com.

Your FAQ's

by Dr Mike Malin, CHAM User Support

CHAM's Technical Support Team (Email: support@cham.co.uk) receives, on average, about 70 enquiries per month, and here we provide information on two frequently-encountered problems.

"The PHOENICS EARTH Code terminates prematurely during a run with no error message, and control just returns to the VR Editor display."

More often than not this occurs because the CFD run has diverged, i.e. an arithmetic underflow or overflow has been encountered and the EARTH run fails. There is a DVF compiler option which would trap mathematical errors, but if it were introduced by CHAM this would slow the computation time significantly. Divergence is diagnosed by watching for rapidly increasing residuals or very unrealistic monitor values on the dynamic graphical display. Such behaviour indicates divergence, especially if no error message is written to the RESULT and other output files.

"After installing PHOENICS, when I click on 'compile' from the VR Environment, I encounter the error message 'Bad command', 'Out of environment space' or 'Too many parameters'."

If 'Bad command' is encountered when attempting to compile via the VR Environment, the problem is usually because the path name to dfvars.bat is incorrect in the file /phoenics/d_utils/d_windf/windf.bat. The relevant part of the windf.bat file looks like:

```
set DFDir=c:\Progra~1\Devstu~1\DF
rem
echo Adding DIGITAL PHOENICS to path
path = \phoenics\d_utils\d_windf;\phoenics\d_utils;%path%
call %DFDir%\bin\dfvars.bat
```

When the DVF compiler was installed on the user's computer, it may have not been placed in the correct directory, but in some other directory or even on a different drive. For V5.0 of the compiler, it should be installed in the directory c:\Progra~1\Devstu~1\DF\bin\dfvars.bat.
For V6.1, it should reside in c:\Progra~1\Micros~2\DF98\bin\dfvars.bat.

If the user adopts the non-standard practice of installing PHOENICS on any drive other than c, with the digital compiler on the c drive, then he must modify his windf.bat script accordingly. Note that for V5.0, the dfvars.bat compiler normally resides in: c:\Program Files\DevStudio\DF\bin\, and for V6.1, it resides in: c:\Program Files\Microsoft Visual Studio\DF98\bin\. The path \Microsoft Visual Studio\ has to be truncated to \Micros~1\ or \Micros~2\, etc depending on how many Microsoft directories are located under the directory Program Files, e.g. Microsoft Office, Microsoft Front Page, etc. The solution to the 'Bad command' problem is then to determine the location of the dfvars.bat file on your computer and then to correct the path name in the file windf.bat.

The **'Out of environment space'** message may be cured by inserting the following line in your c:\config.sys file: SHELL=C:\COMMAND.COM C:\ /P /E:1024. If this doesn't work, then try the following. When you click on 'compile' and then on 'GROUND', you can try increasing the environment memory for the window in which the compilation is supposed to take place, .e. click on the 'properties' of the window, then click on 'memory' and then under 'Initial Environment' change 'Auto' to say '4096'. This should be equivalent to the 'config file' suggestion made above, but this allows 4MB rather than 1MB for the environment space memory.

The error message '**Two many parameters'** may be cured by modifying the file /phoenics/d_utils/d_windf/windf.bat so that the path statement:

```
echo Adding DIGITAL PHOENICS to path
path = \phoenics\d_utils\d_windf;\phoenics\d_utils;%path%
```

is replaced by:

```
echo Adding DIGITAL PHOENICS to path
path = \phoenics\d_utils\d_windf;\phoenics\d_utils;c:\dos;c:\windows\command
```

This means the path is set explicitly, rather than adding to an existing path by the use of %path%.

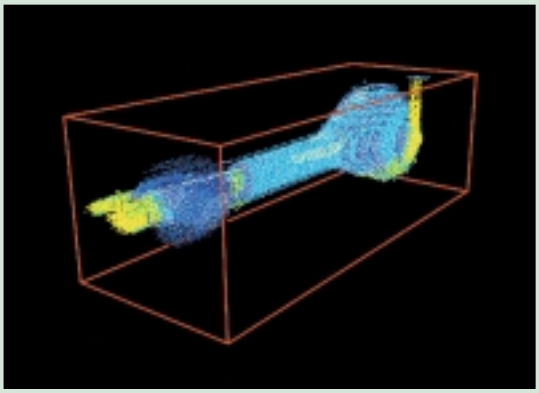
A Practical Solution for Ballast Water Treatment

Dr Omar Badran outlines his PHOENICS model of the "MikroKill" Separator

You may be surprised to learn that the environmental damage caused through the transportation and release of ships' ballast water is amongst the top 5 on the list of issues of most environmental concern for the United Nations. All ocean-going vessels take on and discharge ballast water as a standard practice. Problems can arise from the transportation of micro-organisms within the ballast water, their release into non-native environments, and their effect on the local species. Whilst existing legislation exists for the protection of the environment, requiring ships to replace their ballast water on a frequent basis (i.e. before travelling too far), it is not 100% effective, resulting in serious environmental concerns.

A ship-borne system, called the MikroKill Separator (patent pending 1999-555-25), has been developed by OPTIMARIN A/S of Norway, which removes sediments from water during ballasting, and the MikroKill UV destroys or inactivates biological organisms including zooplankton, algae and bacteria, without affecting the normal operation of the ship. Ballast water is also treated during de-ballasting to ensure that all micro-organisms and bacteria are eradicated before release.

Dr Omar Badran, until recently studying at the University of Hertfordshire, modelled the Separator using PHOENICS for one-phase flow and two-phase flow (water & sediments) to compare the results with the prototype model data. Dr Badran reports that the simulation was very accurate and gave the same results of velocity and pressure for the prototype, and also for the behaviour of the (cyclonic) flow itself.



Velocities through Separator to two outlets

The Optimar Ballast System has now been installed in the Princess Cruises ship "Regal Princess" and represents the first ballast water treatment system aboard an operating vessel. For further information about this interesting project, please contact:

Dr Omar Badran, Al-Balqa Applied University, Email: o_badran@yahoo.com

Dr Arne Holdo, University of Hertfordshire, Email: a.e.holdo@herts.ac.uk

Notices & Events Autumn 2000

CHAM

Mr Peter Spalding, UK
Tel: +44 (0)20 8947 7651

22 Nov, 2000	**1-day PHOENICS-3.3 "Refresher" course**
23/24 Nov, 2000	**VR training - additional topics**
24 Jan, 2001	**1-day PHOENICS-3.3 "Refresher" course**
25/26 Jan, 2001	**VR training - additional topics**
21 Mar, 2001	**1-day PHOENICS-3.3 "Refresher" course**
22/23 Mar, 2001	**VR training - additional topics**

For terms for "Bespoke" and "Advanced" training courses, contact: pls@cham.co.uk

Arcofluid

Dr Jalil Ouazzani, France
Tel: +33 4 42 16 10 20

A one-day seminar, "The new outlook of the PHOENICS code", will be held in the 4th week of November in Bordeaux. People who wish to attend, or wish to attend similar events at other locations should contact: arcofluid@pacwan.fr

The PHOENICS Journal

is a quarterly publication to promote and exchange knowledge and skills amongst PHOENICS users world-wide. Data input files and FORTRAN routines, for GROUNDstation implementation, are published alongside mathematical models and computational results. Contributions to the journal are subject to review by independent referees.

Price: £140 per year (UK)
£165 / $265 (Elsewhere).

Journal Manager:
Mrs Sylvie Stevens

The PHOENICS Journal is now available to 'maintained' customers free of charge. It can be supplied to all others via subscription or purchased through the cfdShop at www.simuserve.com/cfd-shop/journal.htm
Payment by Visa / Mastercard accepted.

PDV

Dr Hans W Mindt, Germany
Tel: +49 234 95 93 213

The next German PHOENICS Users' meeting will be held in March 2001. For further details and registration information, contact: hmindt@pdv-online.de

ACADS-BSG

Mr Murray Mason, Australia
Tel: +61 3 9885 6586

News from Down Under

At the Australian Institute of Refrigeration Air Conditioning and Heating annual conference in Melbourne on 29/30 March, ACADS-BSG hosted a technical stream on CFD. This was an exceptionally well attended session with users of various CFD software presenting a number of case studies. The speakers included two PHOENICS users:

Michael Still, Mechanical Engineer with Connell Wagner who spoke on "Performance Based Car Park Ventilation Solution Verification using CFD Modeling".

Don Alexander, Engineered Fire & Safety Solutions who spoke on "CFD in Fire Safety Engineering: Universal Panacea or NOT?"

Copies of the proceedings of the Conference which include these papers are available from AIRAH in Melbourne (Tel +61 3 9614 8868)

ACADS-BSG was also an exhibitor at the concurrent ARBS Exhibition and their exhibit included demonstrations of the PHOENICS Software

ACADS-BSG attends this event regularly and participation at the exhibition has contributed to the rapid growth in interest in CFD for air conditioning and smoke control applications over recent years in Australia. There are now >20 active users of PHOENICS/FLAIR who have licensed the program through ACADS-BSG.

Contact: Mr Murray Mason, ACADS-BSG, email: acadsbsg@ozemail.com.au

CHAM for North American clients

North American Sales / Technical Support Centre

CHAM is pleased to announce the new appointment of Dr Vladimir Agranat as CHAM's North American representative. His company, Applied Computational Fluid Dynamics Analysis (ACFDA) is located in Ontario, Canada.

In 1978, Dr. Agranat received his Ph.D. in Computational Fluid Dynamics and Heat/Mass Transfer from Theoretical and Applied Mechanics Institute, Russian Academy of Sciences, Novosibirsk. Since then, Dr Agranat has worked in various universities, research institutes and commercial companies including Tomsk State University, Russia; Pedagogical Institute of Sumy, Ukraine; CFD Software Ltd., Dimona, Israel; University of Toronto, Canada; Advanced Measurement & Analysis Group Inc., Oakville, Ontario, Canada and Atomic Energy of Canada Limited, Chalk River Laboratories, Ontario, Canada.

Dr Agranat has published over 60 scientific papers and one monograph on Fluid Mechanics and Heat/Mass Transfer. He has 13 years of teaching experience in Calculus, Ordinary Differential Equations, Partial Differential Equations, Fluid Mechanics, Gas Dynamics, Heat/Mass Transfer and Combustion Science.

ACFDA

Dr Vladimir Agranat, ACFDA, Toronto
Tel: +1 905 709 6402

Dr Agranat has participated in a wide range of CFD applications covering nuclear engineering, power engineering, chemical engineering and fire prevention. Dr Agranat has 10 years of PHOENICS experience and he has been CHAM's representative in Canada since 1998.

With his extensive expertise in CFD, he will provide high quality and prompt technical support for PHOENICS users in North America.

Training courses for Canadian & US PHOENICS users

6 Nov 2000	**1-day PHOENICS-3.3 "Refresher" Course**
7 to 9 Nov, 2000	**Advanced Course (incl BFC & FORTRAN)**
22 to 26 Jan, 2001	**Basic & Advanced Courses**
19 to 23 Mar, 2001	**Basic & Advanced Courses**

For costs & course programme contact Dr Vladimir Agranat, Email: vladimir.agranat@utoronto.ca