

The Focus

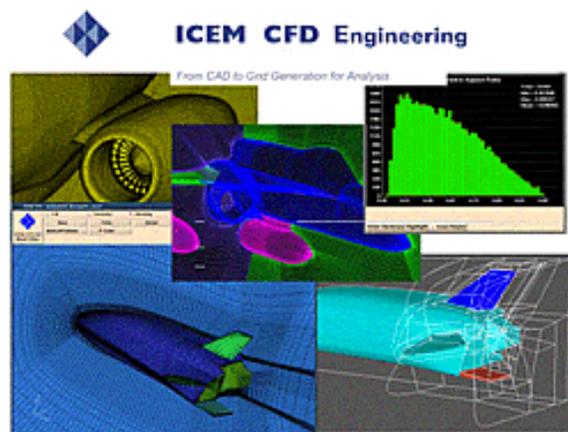


A Publication for ANSYS Users

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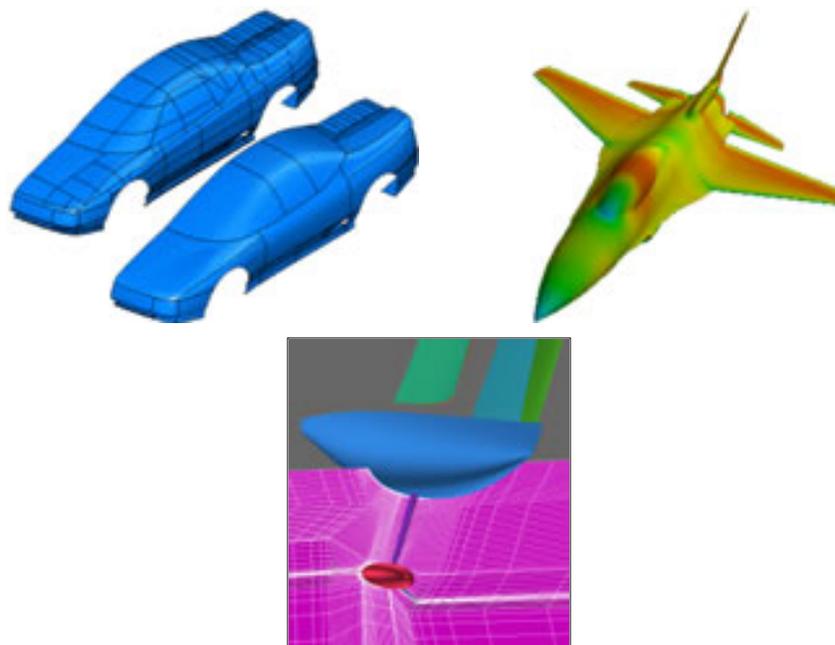
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ICEM CFD: A Powerful Pre/Post-Processor



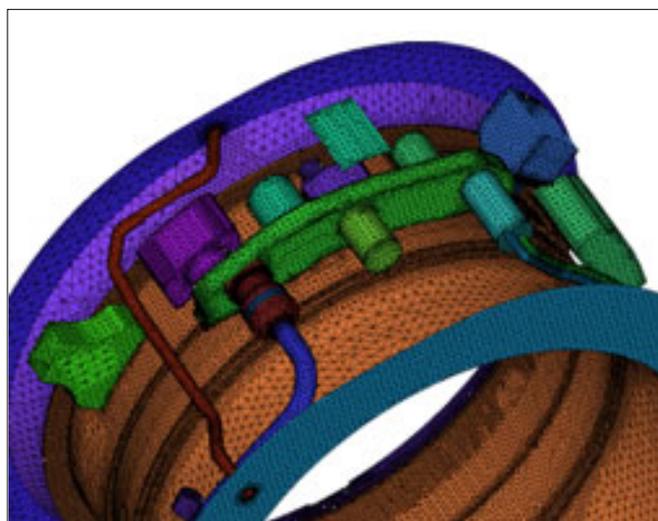
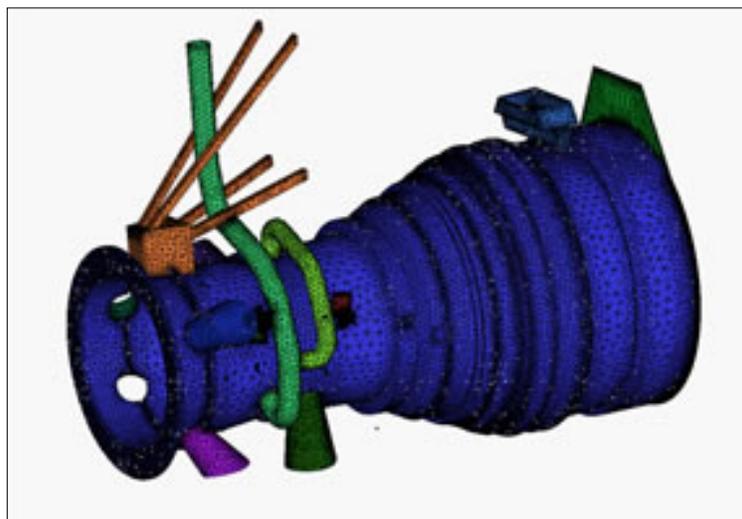
What is this ICEM Powerful Support of Dumb Geometry

- World Class Pre/Post Processor
- NOT a Fluid Solver
- Very popular in the CFD World
 - Primary technical focus in the past
- Built to Handle VERY large models
- Oriented towards the Experienced User
- Supports all major transfer formats:
 - IGES, VDAS, DXF, DWG, STEP(Limited)
- Supports Kernal Formats
 - ACIS, Parasolid
- Always have Faceted as a Fall-Back
 - STL
 - FE: ANSYS, NASTRAN, PATRAN
 - VRML
- Not associative, but still powerful

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CAD Associativity

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- Direct CAD Associativity with leading Tools
 - Pro/E
 - CATIA V4
 - SolidWorks
 - UG
 - Ideas
 - SolidEdge (Oct '02)
- Mesh Setup in Native CAD Environment
- Object Naming in Native CAD



CAD Repair

- Powerful tools to fix bad or overly complex geometry
- Create Geometry
 - EZ-CAD
- Merge out slivers and such
- Fill Gaps
- Remove Features

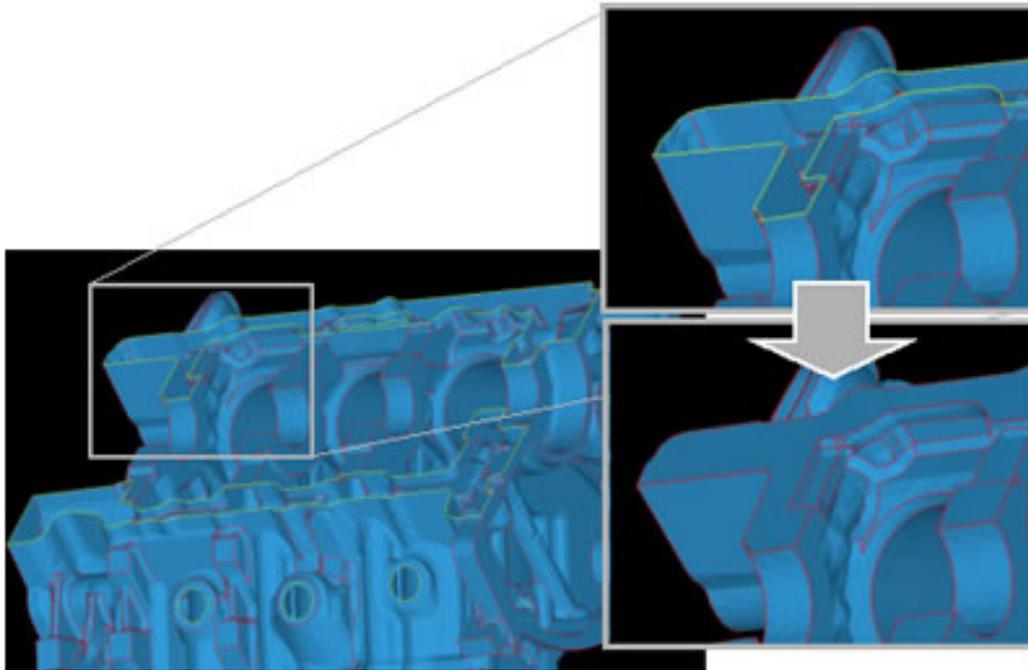
Outputs to over 120 Solvers

- Supports Nodes & Elements for most Commercial and Research Codes (including ANSYS, Nastran, Ideas...)

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Meshing

- ICEM CFD is first and foremost a meshing tool
- Different types of meshing are in different modules
- User has extensive control
- Significant mesh editing adds power to meshing options

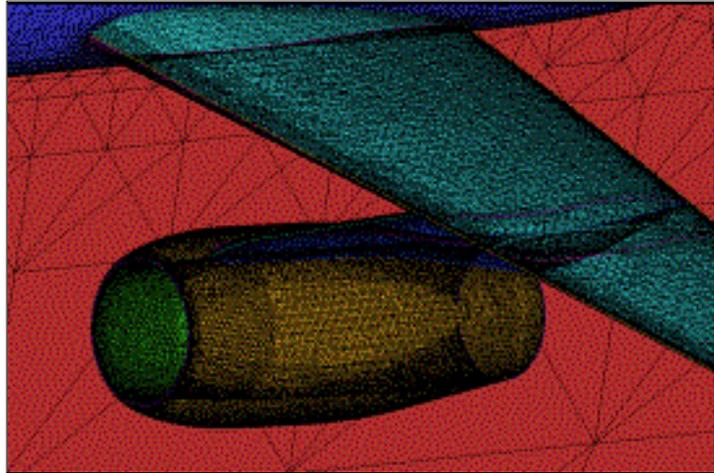
Tetra: Robust and Forgiving Tetrahedral Mesher

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- Uses OCT-TREE approach
- Area Patch Independent
 - Can ignore small features
 - Mesh over gaps and mismatches
- Does not use underlying NURB math to create mesh
 - Just uses it to project mesh to surfaces
- Uses Smart mesh sizing controls to follow geometry
- Coarsen Pass Cleans Up Mesh Considerably
- Prism Layers put refined wedges on boundaries
 - CFD Thing



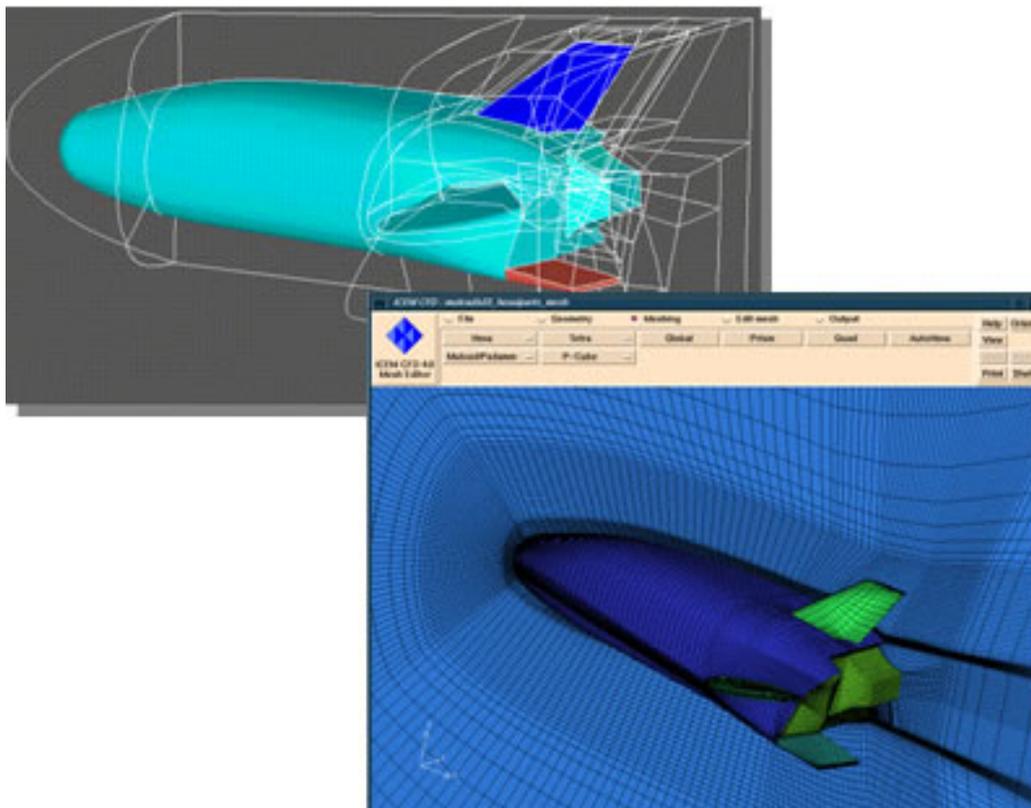
Hexa: Very Efficient and Useful Brick Mesher

- Uses a Unique Blocking Paradigm
 - Slice up model into blocks, then project to geometry
- Does not require user to modify CAD geometry
 - No boolean or curve fitting operations that can fail
- An intuitive process
- Powerful O-Grid Transition mesh for complex geometry
- Once mastered, a very fast way to create HEX Meshes

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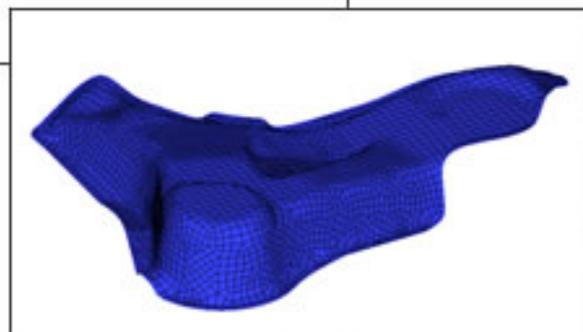
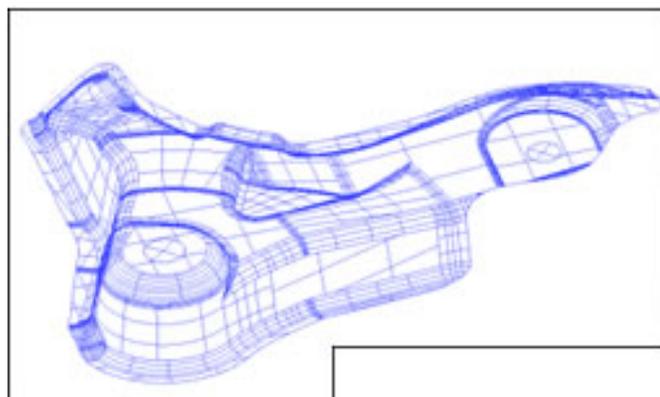


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Quad

- Robust Surface Mesher
- Produces all-Tri or Quad Dominant Meshes
- Lots of Control
- Patch Independent
- Feature Suppression
- Batch Capability



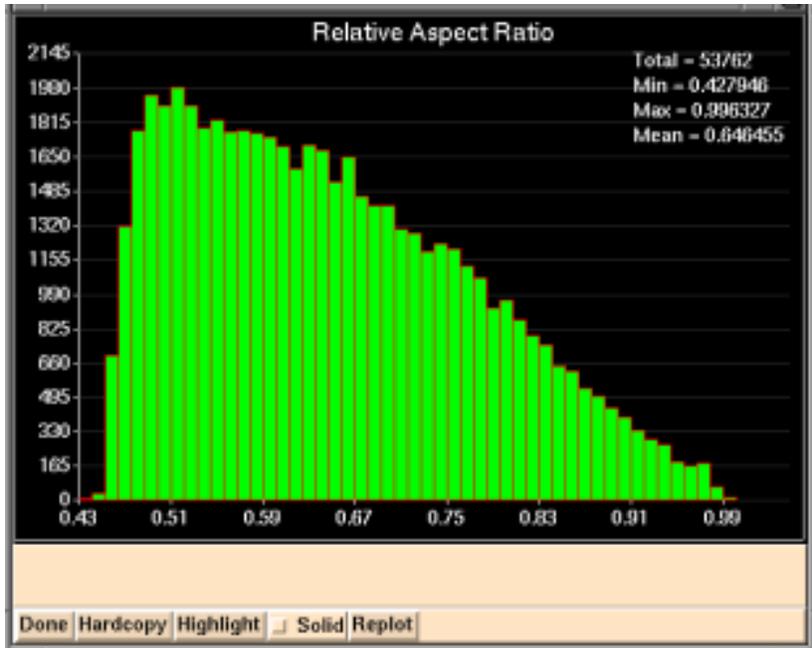
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Mesh Editing Tools

- The hidden strength in ICEM CFD are its Mesh Editing Tools
- Mesh Smoothing
 - Iterative moves and evaluates element quality
 - User can set iterations, criteria and methods
- Mesh Projection then sticks nodes on Geometry
- Histogram Feedback is very useful
- Also have hand modification tools
 - Move node with mouse on geometry
 - Refine/coarsen



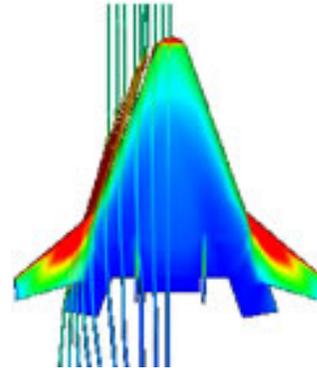
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Post Processor

- Based on new Visual3 technology from MIT
- Client-Server Paradigm
- VERY Fast for streamlines and cutting planes
- Flexible and robust



Much, Much, More

- Many more features in tool
 - Support for loads, materials, and solver options
 - Tet to Hex Transition
 - Result Arithmetic
 - Shrink Wrap
 - Feature Suppression
 - Many CFD Related Features
 - Customization
- Development is driven by need
 - Close customer relationships
 - 50+ Consultants on staff that use ICEM CFD daily

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ANSYS Heat Transfer: Should Radiation Be Included?

by [Luis Rosales](#), Thermal and Fluid Analyst

The purpose of this article is to make users aware that radiation may play an important part in their thermal simulation. In many thermal analyses, radiation may be insignificant in comparison to other modes of heat transfer. However, the user should be aware of radiation when it becomes important. In the simple example below, radiation is shown to make a difference. The model consists of a small chip mounted on an aluminum board. A constant heat flux is applied to the surface and natural convection boundaries are applied on all the other surfaces. Figure 1 shows the temperature field for the model without radiation and Figure 2 shows the model with radiation. The difference in maximum temperature is about 5 degrees. This difference may not be important in some analyses but may be highly critical in others. A simple method of determining the importance of radiation is to do a quick hand calculation using the radiation equation and compare that to the hand calculated heat transfer value for other modes of heat transfer, such as convection. Any value for radiation that appear to be greater than about 5% of the total heat flow should include the effects of radiation.

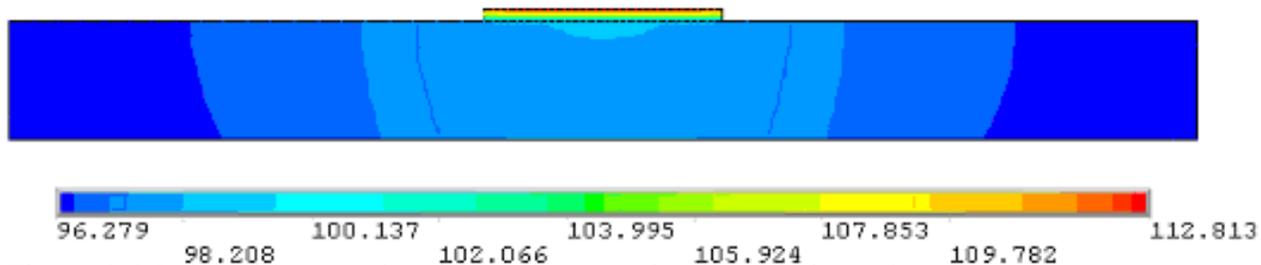


Figure 1. Model with natural and forced convection boundaries only.

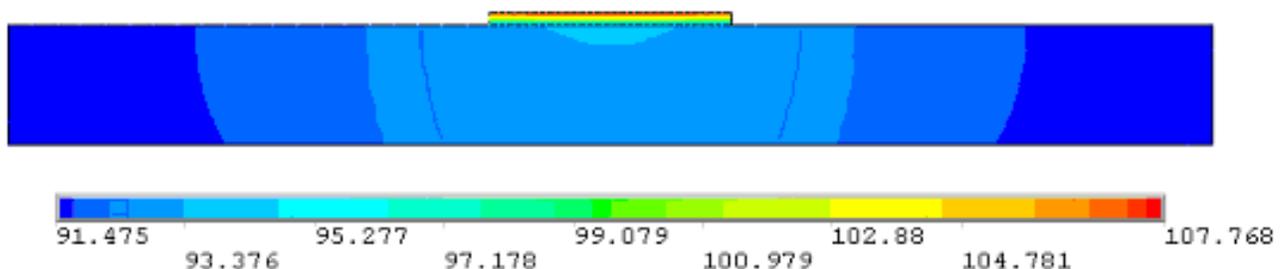


Figure 2. Model with the inclusion of radiation to the surroundings.

Conclusion

The example problem illustrates the difference that radiation can make on the maximum temperature. As stated earlier, a simple hand calculation can help determine whether radiation should be included in the model.



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Applying Piecewise BC's Using the Function Editor

by [Rod Scholl](#)

The function editor is a GUI-driven tool released in version 5.7 that is underutilized in applying boundary conditions (BC s). One of the capabilities easily afforded by the Function Editor is the ability to define piecewise functions. This avoids

In the Function Editor GUI you can directly type the defining functions as well as the domain over which they are valid.

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Function Editor

File Edit Help

Function | Regime 1 | Regime 2 | Regime 3 | Regime 4 | Regime 5 | Regime 6

Function Type

Single equation

Multivalued function based on regime variable

$xloc = (x)$

Degrees Radians

LIST

() GRAPH

MIN ASIN e^x

MAX SIN LN 7 8 9 / CLEAR

RCL ACOS 10^x

STO COS LOG 4 5 6 * ←

INS MEM ATAN SORT

3 - ENTER

. + ENTER

Regime 1 Limits

$\leq x \leq$

Result = $\{PRESSURE\}/3$

Regime 2 Limits

.1 < $xloc \leq$

Result = $\{PRESSURE\}/4*\{TEMP\}$

Annotations:

- Single Equation: e.g. $xloc = Pressure/3*Temp$
- Piecewise Equation: e.g. $0 < x < 0.1, xloc = Pressure/3$; $0.1 < x < 0.75, xloc = Pressure/4*Temp$
- Regime variable defined
- Define each region's function

There is an easy tutorial in the ANSYS help files to get you started. Note that you can reuse/update these functions in different models once you establish them! Given the easy graphing, an application to you model, you might even consider scrapping all those EXCEL tables!

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About *The Focus*

The Focus is a periodic electronic publication published by PADT, aimed at the general ANSYS user. The goal of the feature articles is to inform users of the capabilities ANSYS offers and to provide useful tips and hints on using these products more effectively. *The Focus* may be freely redistributed in its entirety. For administrative questions, please contact [Rod Scholl](#) at PADT.

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All past issues of *The Focus* are maintained in an online [library](#), which can be searched in a variety of different ways.

Contributor Information

Please don't hesitate to send in a contribution! Articles and information helpful to ANSYS users are very much welcomed and appreciated. We encourage you to send your contributions via e-mail to [Rod Scholl](#).

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