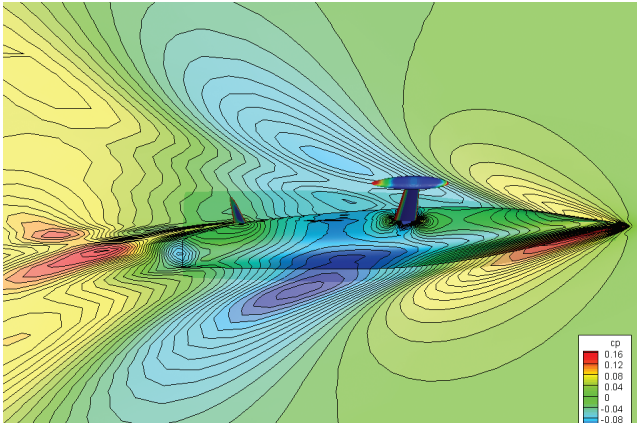


GridgenApp

A Unique Gridgen® Application



Plotting to Win the America's Cup



View of hull bottom. The final flow solution for this panel model shows the distribution of pressure over the yacht surfaces and on the free surface (where the wave elevation is proportional to the pressure coefficient).

The America's Cup is the world's oldest sporting trophy. Big, technology-laden racing yachts representing yacht clubs from countries around the world compete for the right to hold and defend this ornate piece of silver.

With recent syndicate budgets running in excess of \$100 million, teams invest significant effort in testing their hydrodynamic designs. Every angle is investigated with a wide range of tools from simple empirical relationships to very expensive scale model towing tank tests.

Designers also use an arsenal of advanced software to perform extremely sophisticated numerical calculations aimed at solving the fully 3D and viscous Navier-Stokes equations that govern the fluid dynamic flow fields under the water and in the air.

The wave shape, the waterline contour and the extent of the wetted portion of the hull are not known in advance of the flow simulations and must be determined as part of the flow calculations. This requires special hydrostatic and hydrodynamic boundary conditions on the free-surface panels.

The dynamic sink and trim (pitch angle) of the model "underway" also are not known in advance. A series of alternating SPLASH

flow calculations and model re-flotations and re-panelizations are conducted, ultimately converging to final solutions. SPLASH is a free-surface panel code used for flow simulation and performance prediction for yachts and ships.

Gridgen's elliptic meshing algorithms provide the high-quality panelizations required to make it all work. ACCPAN also incorporates methods to externally specify parameters used within Gridgen to control elliptic mesh generation.

There are many other tasks where using Gridgen is critical. These include

- Interrogation, modification and repair of yacht geometry databases
- Research and development of new panelization strategies
- Non-standard yacht geometries and non-yachting applications.

Gridgen software also offers a complete suite of volume meshing tools for structured, unstructured and hybrid meshes so it can be used when simulation needs call for other types of CFD simulation, such as full Navier-Stokes.

America's Cup teams undertake parametric studies of yacht designs. In these tests, Gridgen's scripting language, Glyph, can be used to automate as much of the database preprocessing as possible.

To view the results of their flow simulations, the analysts at South Bay Simulations use Tecplot scientific visualization software from Tecplot, Inc.

South Bay Simulations works on Linux with command-line codes and shell scripts, which aren't very graphical. We use Tecplot for all our presentation needs, including the figure shown here.

Gridgen and Tecplot give South Bay the confidence that we will be able to effectively communicate and collaborate with America's Cup teams and yacht designers all over the world.

Article by Bruce Rosen, president of South Bay Simulations, Inc.