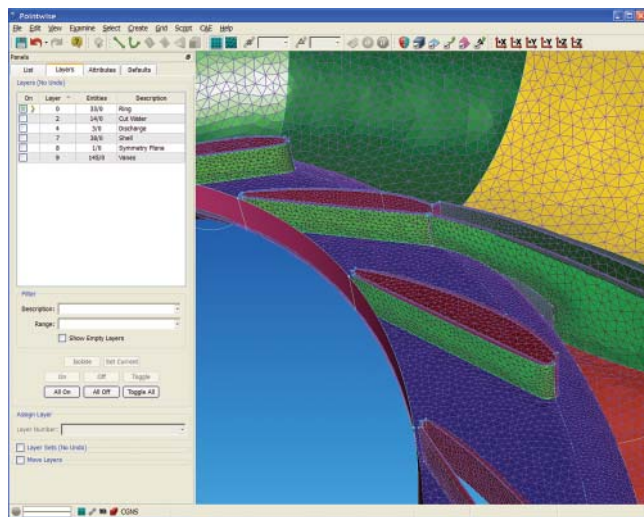


FocalPoint

The Newsletter for Gridgen® Users

Volume 11 Issue 1 Spring 2007

Pointwise Coming This Summer



Frequently used commands are one click away with Pointwise's new interaction.

Pointwise, our next-generation meshing software and Gridgen successor, has begun the final stage of release testing prior to production release this summer. After over 23,000 hours of development effort and five months of testing by our 35-member beta team and our 31-member advisory team, the new software is nearing production use.

Dr. Steve Karman, a research professor at the UT SimCenter at Chattanooga, is a member of the Pointwise Advisory Team. "I

enjoyed being on the advisory team and seeing the product come together from design plans to alpha and now beta releases," said Dr. Karman. "To me, the ability to navigate the meshing functions rapidly in Pointwise is a huge benefit relative to Gridgen's nested menus. Also, the native Intel-Mac port is great."

All current Gridgen customers will receive Pointwise Version 16 at no extra cost for use in concert with Gridgen Version 15. The two programs will share license management, allowing you to begin the transition to using Pointwise for new work while

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CFD Reduces Drag on F-35

Lockheed Martin is currently developing the F-35 multi-role fighter aircraft in Air Force, Navy, and Marine variants. Each variant has different key performance parameters that must be met contractually, and many of the performance parameters are driven by aerodynamic considerations.

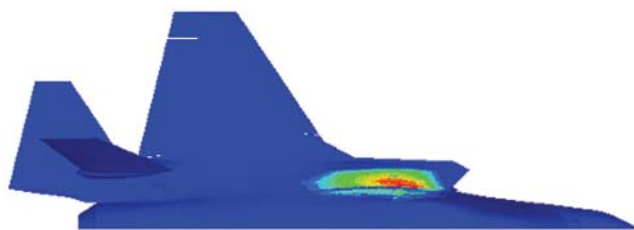


Figure 1. Contours showing change from original configuration. Red shows the largest displacement.

While large-scale wind tunnel tests are relied upon to get the high-fidelity data needed to ensure performance goals are met, CFD is used extensively to pre-screen potential configuration changes and reduce the amount of expensive testing required. In the case described here, CFD was used to redesign the Marine variant of the F-35 for reduced drag and increased internal volume. Reduced drag increases the aircraft range and performance. Increased internal volume allows more fuel to be carried and makes routing of wiring and piping easier.

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Pointwise

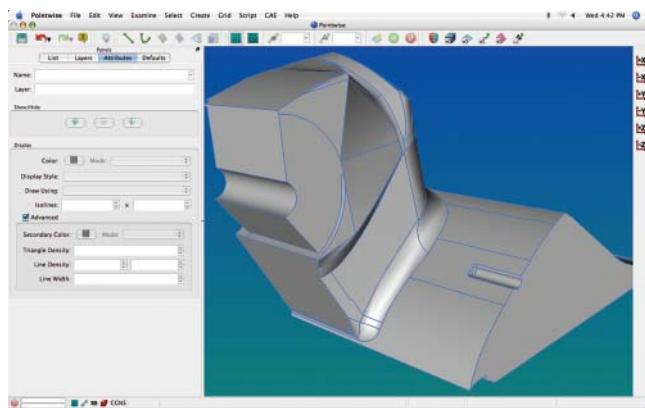
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continuing to apply Gridgen to existing projects. Data can easily be shared between Pointwise and Gridgen; Pointwise reads and writes Gridgen .gg and .dba files.

"I've been a Gridgen user since 1992 and have supported it nearly as long," wrote Erick Gantt, an Engineering Specialist in our support team. "Gridgen has consistently provided the tools I have needed to get the job done with high quality results. But Pointwise now gives me all that along with the flat interface, customization and standardization I've always wished for in Gridgen. If you do a lot of meshing, how could you not be excited?!"

New Interaction for a New Generation

Customers have regularly inquired about an upgrade to Gridgen's 23-year-old interface to minimize the amount of interaction required to apply the grid generation methods. New users have also clamored for an interface that looks and acts more like other software in order to minimize their learning curve. At the same time, it became apparent that a new software architecture was needed to support development of requested features in the future.



Pointwise's first release supports Windows, Linux, IRIX, and Mac, and includes 32-bit and 64-bit versions.

Some of the changes in Pointwise's GUI are obvious. The customizable toolbars provide one-click access to frequently used commands. The text menus provide top-level access to 100% of the software's functionality. Pointwise also follows de facto standard interface conventions for selection and hot keys, making learning the software quite easy.

More Than Skin Deep

There is more to Pointwise than just a new GUI. Many powerful

new features have been added to make grid generation simpler and faster.

For the first time, Undo and Redo are available. Implemented as a state machine, Undo can reverse up to 20 commands. With Undo, you can confidently explore and experiment with new commands or lesser used options.

Structured, unstructured, surface, and volume grids are built automatically using a new Assemble command in Pointwise. For complex topologies, the manual edge-by-edge method familiar to Gridgen users is still available.

Pointwise's project (.pw) file stores both the grid and the database, unlike Gridgen where they are stored separately. You will never forget which database goes with which grid again!

Pointwise is full of other new features like improved CGNS support, VRML 2.0 support, creation of multi-segment database curves, shell intersections, domain orientations, and many more.

Big Grids Need 64-Bits

The first release of Pointwise will support a mixture of our most popular platforms in both 32-bit and 64-bit modes with the 64-bit version offering access to up to 16 exabytes of memory. Also, Pointwise will export files larger than 2GB in both the 32-bit and 64-bit versions.

Platforms supported in Pointwise's first release include Windows XP and Vista (32-bit), Linux (32-bit and 64-bit), Mac OS X (32-bit), and IRIX (32-bit and 64-bit). Pointwise for Windows and Linux supports both Intel and AMD processors. Other platforms will be available in subsequent releases.

The Transition Begins

Gridgen and Pointwise will both remain in production use while you begin your transition to the new software and while we complete the migration of all of Gridgen's core techniques to the new software. More information about Pointwise is available on our web site at www.pointwise.com/pw. Watch for our Pointwise release announcement later this summer. ■



F-35

(Continued from page 1)

Figure 1 on the previous page shows how the outer contours of the F-35 were changed from the baseline configuration. As you can see from the figure, the volume has been increased somewhat by pushing out the upper contour of the aircraft near the lift fan that is used for vertical takeoff and landing. In the CFD study, we wanted to see how this would affect drag.

Lockheed Martin has refined its CFD analysis process over many years to achieve rapid turnaround times. It starts with a geometry database from CATIA V4 or V5. Gridgen is then used to build structured surface and volume grids which are exported to Falcon, a full Navier-Stokes CFD code developed in-house at Lockheed Martin. The results from Falcon are postprocessed with the Lockheed Martin Aero Loads Code and FIELDVIEW.

For the current study, we used a grid of 177 blocks and approximately 27 million grid points. The near-body grid, seen in Figure 2, contains 172 blocks. The far-field is modeled with 5 blocks, and there is a non-point-to-point interface between the near-body blocks and the far-field blocks.

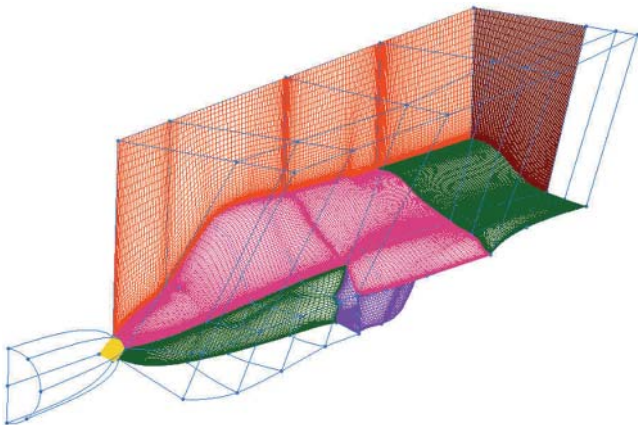


Figure 2. This is a small position of the overall block system.

Gridgen's custom named boundary conditions were used extensively to divide the surface of the F-35 into separate integration regions. Dividing the surface into over 30 separate regions provided additional diagnostic information during a run and helped explain the local effects of shape modifications.

The Falcon CFD solutions were run in parallel on a Linux-based, 384 processor cluster. A typical run would use 64 processors over 4 days to generate a baseline solution. Subsequent runs could be started from the baseline for up to 66 percent reduction in solution time.

Figure 3 shows FIELDVIEW plots of pressure coefficient for both the baseline configuration and the modification. It appears there are only small differences in the pressure distribution due to the shape change and that the changes are confined to the region near the modification. However, experience has shown interpretation of pressure distributions can be misleading, so further manipulations of the pressure data were done using the Lockheed Martin Loads Code.

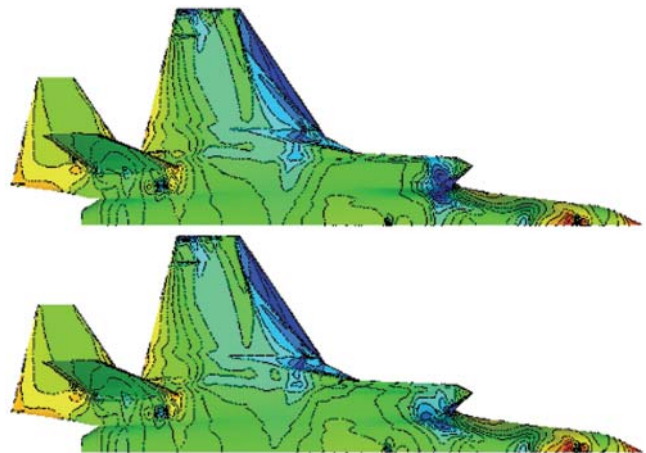


Figure 3. Pressure contours before (top) and after (bottom) the shape change show little apparent difference.

The Loads Code was used to evaluate local surface slope and pressure to derive the x, y, and z directed components of local surface pressure for each grid point. This provided further insight into how the surface shape changes had affected aerodynamic performance.

The next step taken to evaluate the effects of the surface shape change was to again use the Loads Code, this time to determine the increments in lift coefficient (DCL), drag coefficient (DCD), and moment coefficient (DCM) at each grid point. The results were then plotted in FIELDVIEW as shown in Figure 4.

Looking at the data in this manner shows a lift coefficient increase (blue) on the wing that was not apparent from looking at pressure distributions alone. Examination of the drag coefficient increment showed a problem area of increased drag (red) aft of the shape change that was not noticed before. This resulted in a subsequent modification to the shape change to reduce the problem area. The moment coefficient increment shows there was an increase in the overall moment coefficient.

(Continues on page 4)

Applied Research

Nick Wyman to Head New Research Group at Pointwise

Pointwise is pleased to announce that Nick Wyman has been named Director of Applied Research. The goal of the new Applied Research Group is to partner with other companies and government organizations on development projects that will improve Pointwise's products.

Nick has been actively developing Pointwise software for over 9 years. As Manager of Product Development, he led the team through many releases of Gridgen and development of the soon to be released, state-of-the-art, Pointwise product. Prior to joining Pointwise, Nick performed CFD analysis for a wide variety of industries and developed mesh generation software for turbomachinery.

"The formation of the Applied Research Group is very exciting. It will allow us to focus on long term development projects which will be extremely valuable for Pointwise clients," said Nick. "By partnering with customers, we will be developing the meshing technology most important to our users."

Significant new features in Pointwise's Gridgen software resulted from prior contracted development projects. For example, the multigrid elliptic solver and solid modeling capabilities were developed in partnership with the United States government. The Applied Research Group plans to build on this success.

For more information about Pointwise's Applied Research Group, contact Nick Wyman at 800-4PTWISE or research@pointwise.com.

F35

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Finally, the lift, drag, and moment data was corrected to account for trim effects. This showed a trimmed drag coefficient reduction of 0.00062 compared to the baseline aircraft configuration at cruise conditions.

The proposed modification was built and tested in the Arnold Engineering Development Center 16T wind tunnel. It showed excellent correlation with the CFD results. Based on these results, the proposed shape modification was incorporated into the final aircraft design.

Based on AIAA 2006-3663, **Use of CFD in Developing the JSF F-35 Outer Mold Lines**, Perry A. Wooden and Jeff J. Azevedo, Lockheed Martin Aeronautics Company. ■

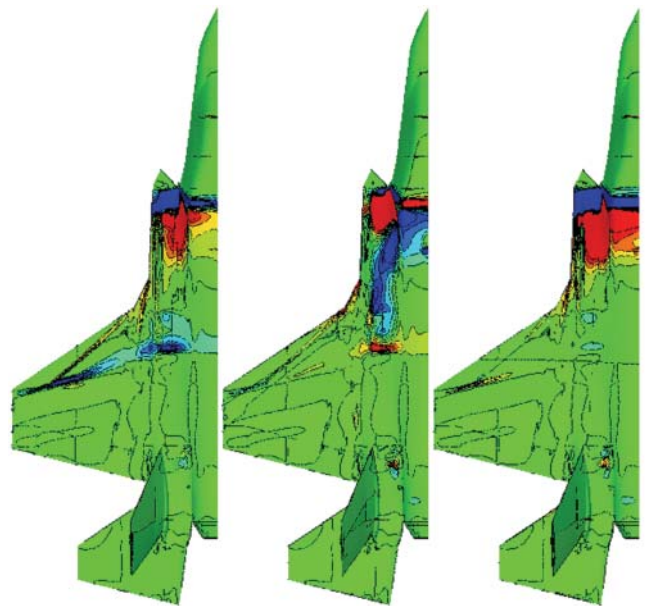
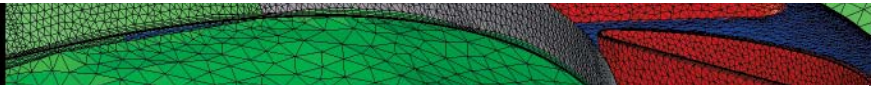


Figure 4. Plots of change in lift (left), drag (center), and moment (right) highlight the configuration differences.

Partner Highlight

Tecplot®

Enjoy the View™

Tecplot, Inc. was formed in 1981 with the goal to develop and apply computational fluid dynamics (CFD) software for the aerospace industry. Since then, their objective changed to focus on delivering effective visualization software for engineers and scientists worldwide.

Tecplot's software tools provide extensive CFD post-processing functionality, as well as XY, 2D and 3D data plotting, analysis, and visualization capabilities. Tecplot 360 brings all of this functionality together in just one software tool to help engineers analyze and communicate their results to colleagues and management with brilliant, high-quality output.

With Tecplot, engineers can easily automate routine data analyses and graphing operations. They create macros by recording them or writing scripts with an easy-to-use macro language and put frequently used macros into the "Quick Macro Panel" for easy one-click access.

Additionally, Tecplot 360 takes the headache out of creating animations with a simple one-click animation feature. With DVD like controls on the sidebar users can quickly step through a solution. Need to get an animation into a PowerPoint presentation or a plot into a Word document for printing? No problem. Simply cut and paste work from Tecplot 360 right into the Microsoft application.

Unlike other visualization products, Tecplot 360's full range of plotting capabilities, unique multi-frame workspace, and top-rated customer support gives users an unparalleled edge for effective analysis, presentation, and publication of their results.

The introduction of new functionality in the latest release of Gridgen to output Tecplot PLT files will be of great value to the Tecplot user community.

Tecplot software provides a versatile, efficient way to analyze and present results. For more information on Tecplot products and services, check them out on the web at: www.tecplot.com. ■

Training Services

Are you looking to improve your grid generation skills? Pointwise may have the training class for you. Check out our training webpage at www.pointwise.com/support/train.shtml for a course near you.

Special Offer for Users of STAR-CD and STAR-CCM+

Pointwise is offering a special discount to STAR-CD and STAR-CCM+ users. Any STAR-CD or STAR-CCM+ user purchasing a Gridgen license before 30 September 2007 will receive 50% off the price of the license. This only applies to new licenses and only for the first year of the license. For more information, contact our sales department at sales@pointwise.com.

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FocalPoint is a publication of Pointwise, Inc. It is for Gridgen users and people interested in learning more about Gridgen and numerical grid generation. It includes information about the latest release of Gridgen, future development plans, and tips on how to get the most out of Gridgen while saving time in grid generation. Pointwise and Gridgen are registered trademarks and GridgenGlyph is a trademark of Pointwise, Inc. All other trademarks are property of their respective owner. Copyright © 2007 Pointwise, Inc. All rights reserved.

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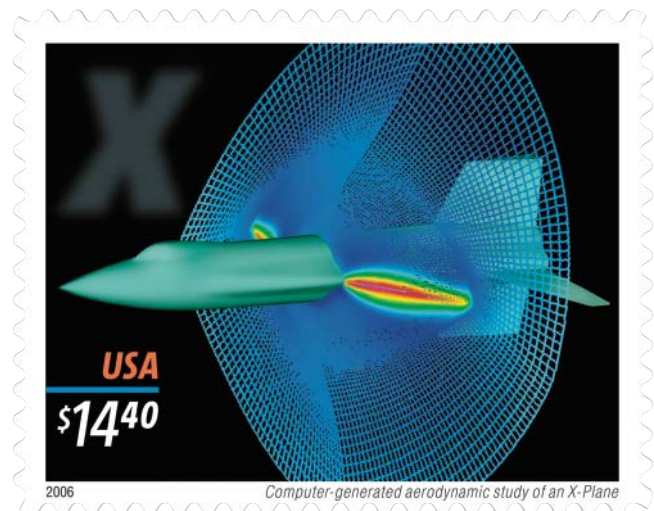
Gridgen Mesh Appears on X-Plane Express Mail Stamp

The United States Postal Service (USPS) recently issued an Express Mail stamp featuring NASA's X-15 aircraft. The stamp image also shows a CFD grid generated using Pointwise's Gridgen software.

The \$14.40 X-Plane Express Mail stamp features an image of the X-15 aircraft from NASA computational fluid dynamic simulations. The stamp shows color contours of the simulated flowfield against a mesh to illustrate the vehicle aerodynamics. It just so happens that NASA engineers generated the mesh for this CFD simulation using Pointwise's Gridgen meshing software.

"You can't imagine how excited, and to be quite honest, surprised we are to see CFD and a Gridgen mesh on a U.S. postage stamp," said John Chawner, Pointwise's president. "It's great to see the technology illustrated in this broadly distributed medium. The stamp captures the legendary X-15 hypersonic aircraft, the exciting new CFD technology, and the essence of express mailing."

To commemorate this event, we have made some T-shirts imprinted with the stamp image. You can be one of the few people to own this limited edition T-shirt. Simply be one of the first 20 people to fill out the form at www.pointwise.com/xplane and we will send you one. ■



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