

WHY

High-End CAD-Integrated CAM Dominates the Market

More than one third of the total CAM market belongs to EDS PLM Solutions's NX CAM, Dassault Systemes's CATIA CAM, and PTC's Pro/NC.

Louise Elliott

According to a recent study by industry analysts at CIMdata, although Mastercam, a midrange system from CNC Software (Tolland, CT; mastercam.com), has the largest number of industrial and educational CAM seats worldwide, more than 37% of the total CAM market in terms of dollar sales to end users belongs to EDS PLM Solutions (NX CAM) with 14.7%, Dassault Systemes (CATIA CAM) with 12.7%, and PTC (Pro/NC) with 9.9%.

The popularity of these systems arises in part from their CAD integration, which makes it unnecessary to deal with problems caused by data transfer, in part from their wide range of capabilities, and in part from their surprisingly reasonable cost. These programs also automate the capture of tolerances from CAD to make NC programming easier.

Of the three systems, NX and CATIA are geared toward the greatest number of machining operations, and have many users in production machinery, die and mold making, and the highly complex machining required for aerospace manufacturing. Pro/NC focuses on production machinery and die and mold machining—with a heavy emphasis on machining molds for plastic products.

Of the three, the NX product has the longest history. As Unigraphics Solutions, the company's experience goes back 27 or 28 years, before the actual development of software, says Vynce Paradise, director of marketing, NX Manufacturing, for EDS PLM Solutions. "We've found that combined CAD and CAM has been a universally important feature. In fact, the joint capability is a key differentiator between high-end and

midrange solutions. While many of the midrange products have some modeling capability, they are generally stand-alone packages that specialize in one or two areas of manufacturing."

Dr. Juergen Lauscher, IBM PLM's CATIA CAM marketing manager, says, "Midrange CAM programs always have to get from the geometry to NC, and they have to use translation protocols such as IGES and STEP, which don't transfer anything but the pure geometry. That means they lose features and intelligence, and sometimes faces and surfaces. The problem can be avoided where design and NC programming are integrated."

Francois Lamy, director of production for Manufacturing Applications at PTC, goes even further, saying, "What sets CAD-integrated CAM systems apart from the midrange is breadth of applications. Generally, midrange programs will do milling or turning, or something—not a full range of applications, nor with many choices of how to perform those applications."

Bob Sammut, development manager of Manufacturing Product Solutions for EDS PLM Solutions, says that three rough

categories of CAM solutions exist: prismatic parts—consisting of objects with planar faces and holes, and belonging in the arena of production machinery such as printing presses; die-mold machining, including tooling—an area that accounts for about 40% of the total CAM market; and complex aerospace-type machining of such products as turbine blades and airframes. The more complex the shapes of the parts being manufactured, the more complex the equipment used to make it. For example, Sammut says, "Aerospace components such as turbine blades and airframes require multi-axis machining and turning. Today, these jobs can be done with single, very complex machines that need skilled programming. Only a few CAM programs can handle this kind of machining—NX, CATIA, Open Mind [Unterföhring, Germany; openmind-tech.com], and Surfcam from Surfware Inc. [Westlake Village, CA; surfcam.com]."

In all three cases, the CAM functionality comes with the CAD system—but users can specify the degree of complexity they need from the CAM pro-

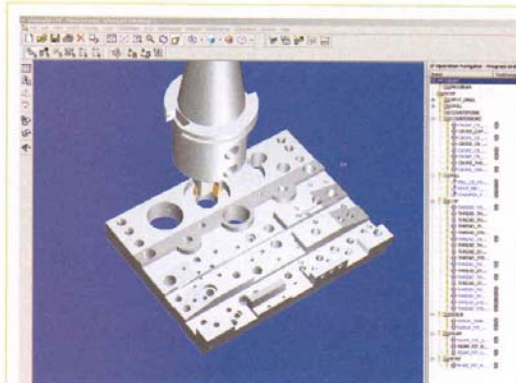


Figure 1:

The NX CAM feature-based hole-making application can be driven automatically by data added by the NX product and tool design applications, a key advantage over analyzing basic models from a third-party CAD system.

gram, and the resulting price range puts the high-end systems in the same ballpark as many midrange systems that sell for \$5,000-\$10,000 without CAD. CATIA CAM's range runs from about \$9,000 to \$35,000; NX CAM from about \$10,000 to \$25,000; and Pro/NC from \$10,000 to \$19,000. These prices include the basic CAD program.

All of them say that they can work with models created in other CAD programs. Lauscher of IBM says, "Instead of just getting geometry with no features,

CATIA has feature recognition, and can create a list of features so that programming can start from the list. It adds another operation to CAM, but it's possible to apply machining processes quickly."

PIC and EDS PLM Solutions have created interoperability tools to make it easy for NX and Pro/Engineer to work with each others' files. Pro/E uses Parasolid, ACIS, IGES, and STEP to read other files. Sammut of EDS says that NX CAM "can

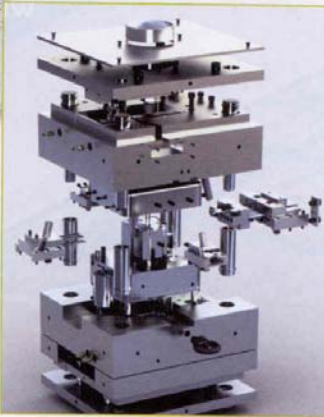
work with incomplete geometry, because the Parasolid kernel has tolerant modeling and will maintain shapes despite perceived gaps. The CAM program is very sensitive and has routines that enable it to ignore or eliminate gaps."

Users of these programs tend to be highly experienced. For example, Mark Riley, engineering supervisor for Cam-Tech, an aerospace supplier in Dallas, has used CATIA V5 CAM for more than a year,



◀ **Figure 2:** This figure shows all of the applications that are available in Pro/E CAM for mold maker: design, detailing of mold base, creation of mold base, core/cavity creation, NC toolpath generation, and plastic injection analysis.

▼ **Figure 3:** Rendering of a mold in Pro/E using the Mold Design Option.



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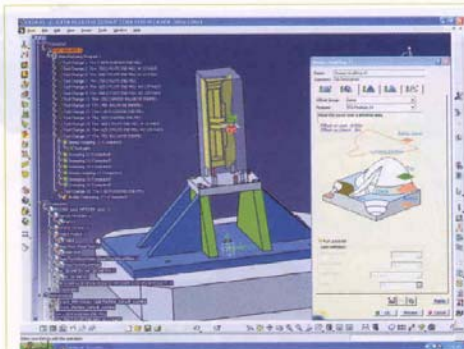


Figure 4:
Aerospace supplier CAM-Tech
Image of CATIA CAM.

after having used a number of midrange programs in the past. He finds CATIA very comprehensive and describes it as more operator-friendly than any other program he's used. "I can go from a model to the Product Workbench with ease, and see parts, models, and machine tool components. All I have to do is click on icons to change the view. Then I go to the Advanced Workbench where I can make the product ready for machining. Moving from model to product and into drafting is just as easy," Riley explains.

He also says that using CATIA has resulted in major time savings: "Although each situation is a little different, I can reduce job times by up to 50%." The time saving comes from the system's ability to store repetitive operations in a catalog, so that the operator doesn't have to work interactively on every job. NX CAM has similar automation capabilities through a knowledge-based system that runs inside the program.

Rick Vernon, staff engineer with Pratt & Whitney (East Hartford, CT), has used UG (now NX) CAM for 15 years. He is also a member of EDS PLM Solutions's aerospace special interest group (ASIG), working with the company to identify desirable enhancements to the CAM software so that individual companies don't have to maintain their own codes for special operations. He says, "This software handles data migration very effectively, and the company works closely with customers to get specialized capabilities incorporated into the commercial software. We selected UG CAM 15 years ago because it handled the largest amount of aerospace disciplines without data translation—and if I had to pick a system now, I'd choose it again."

Aaron Spicer, tooling designer for Tech Tool & Molded Plastics Inc. (Meadville,

PA), uses Pro/NC. In the past he had problems when trying to keep data together between CAD and CAM, and says, "With Pro/NC I don't have to send CAD data to separate files, and in most cases I don't have to deal with the problems caused by IGES transfer." He finds that Pro/NC, like CATIA and NX, is moving toward automating repetitious operations. "They're making it possible for users to write 'recipes' and share templates with others," he says.

Spicer is chairman for the PTC/Users manufacturing group, and he praises PTC's attention to user input. He also praises the greater ease of use that has resulted from the Wildfire introduction. "I've used Pro/E for years, so I found Pro/NC easy to use—though not necessarily easy to train other people to use. The Wildfire interface has made the learning curve much, much shorter."

The capabilities of these programs (midrange CAM as well) keep growing. As well as catalog/template/recipe-driven tools to automate the process, high-end CAM developers appear to be moving in the direction of feature-based machining and smoothing the programming of today's very complex machine tools.

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