

JUNE 18, 2001



DESIGN COLLABORATION

How to Bring all
Your Partners Into
the Process



The 3rd in a Series of 3 Webcasts...
Design News and PTC Present:

DESIGN COLLABORATION

Live Webcast: Wednesday, June 27 at 11:00 am EDT

DESIGN NEWS, INTEL and PTC

will present a special Webcast addressing one of the biggest challenges you face: **Design Collaboration**.

To be successful, you have to work with partners inside and outside the walls of your company. They may be suppliers. They may be subcontractors. They may even be competitors in other arenas. Most likely they are the people you work with everyday.

Whoever they are, you have to have the engineering tools and processes to work with them efficiently as a team. Your success depends on it. Today it is a challenge, if unaddressed, tomorrow it can be a real competitive handicap.

This special Webcast is a must for anyone involved in the design through manufacturing product development process. The Webcast will tell you what you need to know - and how you need to organize - to collaborate with everyone in your design chain and develop innovative products that meet your customers' individual needs, the first time.

Engineering experts from manufacturing companies like yours will join independent analysts and PTC engineers to help you think through how you can design collaboratively—with people across the hall, across the country, or across the globe.

Topics include:

- Tools for innovating products in a collaborative world
- Processes for collaboration
- Examples of how engineers are collaborating successfully

If you think this doesn't effect you—think again.

Find out how to prepare for the **Design Collaboration** challenges of today and tomorrow. Join *Design News* and our expert panel online, right from your desktop, at 11:00 am EDT on Wednesday, June 27 for a free live Internet broadcast.

Learn from
Industry Experts!



Moderator:
Paul E. Teague
National Editor
Design News



John Wylie
Vice President
MCAD Technical Marketing
PTC



Bruce Jenkins
Executive Vice President
Daratech



Tom Gibbs
Director Vertical Industry Marketing
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Pre-registration for this event is required.
Sign up today!

The New World of Engineering Design

If the TV networks are looking for the next blockbuster in their "Survivor" series, they might look to the manufacturing world

- T**alk about a jungle environment where only the fittest win! The players—mostly engineers—face daunting obstacles that test their mettle every day:
- Most engineers carry a heavy workload, juggling three or four projects at any one time, according to the latest Design News surveys. In some industries—wireless telecommunications, semiconductor manufacturing, machine tools—a third of engineers can be working on up to 10 projects at any one time.
 - Simultaneously, their design cycles are shrinking. Companies know that those who get products to market fast, will be market leaders within five years. Seventy-three percent of respondents to a recent Design News survey say that shortening the design cycle is their biggest challenge.
 - The combination of more projects and less design time, coupled with a growing tendency of customers to require vendors to supply subassemblies of components rather than individual parts, has pushed vendors to outsource parts of design projects. That outsourcing has required engineers to manage the work of others outside their companies—their own suppliers, subcontractors, perhaps even competitors—to get the job done. And those management tasks are new to engineers, who have often worked alone.

- There is a growing demand for customized products from sophisticated customers who want what they want, not just what manufacturers can give them off the shelf. From cars to power transformers, manufacturers are being forced to personalize products to keep their customers happy. The engineers' world has moved to "engineer-to-order" and it's not moving back.

All of this is a far cry from the engineering and manufacturing world of even a decade ago. Engineers were certainly busy and competition was definitely tough, but things were more predictable. Companies knew who their competitors were. And, the Internet had not yet burst on the scene, giving customers faster and easier access to more companies and more product information than ever—and simultaneously raising their expectations of the level of support and service they could expect from suppliers.

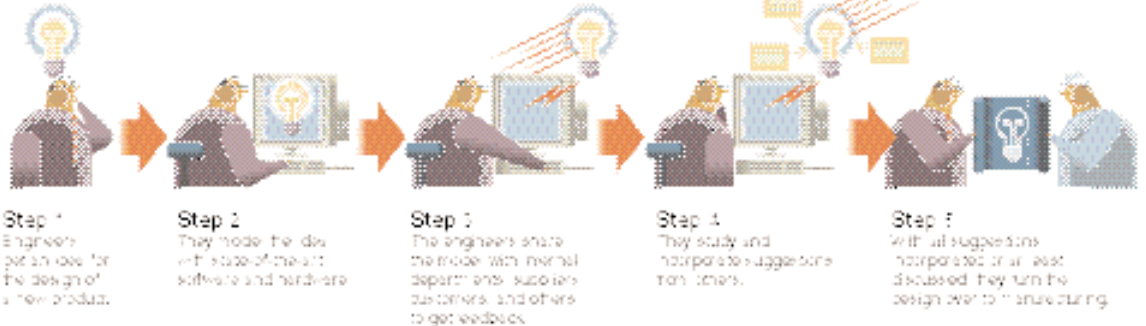
But, just like the hearty souls competing in the TV "reality" shows to date, engineers are learning that the best way to win is to work together—to collaborate. And the list of parties they have to collaborate with begins with internal purchasing, manufacturing, marketing, and other departments within their own companies. Today they have tools that better enable collaboration, such as a variety of PTC® software products and the power of Intel® architecture-based systems.



First, look inward

So, manufacturers' first task in the new world of engineering design is to take stock of their own internal processes. Process redesign, organizational change management, and technology initiatives should be synchronized for the best cumulative results. Engineers have to be sure that they have the tools—and mindset—in place to bring everyone in their company with a stake in their products into their design procedures. Progressive companies have found ways to do that by, among other things, using PTC®'s

The design process



Pro/ENGINEER® and Pro/INTRALINK®, and ensuring that the software and applications are built on open standards-based architecture from Intel®—platforms that are reliable, scalable and affordable.

But how do you connect with customers—or any business partner for that matter—to share data openly and freely? Part of that answer lies in the choice of the underlying technology platform. Yet surprisingly that infrastructure is not always first and foremost on the business manager's mind. In today's cost-competitive environment with demands for performance excellence, it must be. Intel delivers an open architecture that allows businesses to collaborate with anyone, anytime, anywhere in the world. And when your platform is open, you have much more freedom to choose and "layer" applications. Whether it's on the front-end (i.e. a workstation) or the back-end (a large database), Intel's processors provide the high performance, cost-effective power needed in servers, personal computers, information appliances and mobile devices that power e-Business. And that means you're not locked into an expensive, proprietary system that just may stifle future innovation and growth. In times of rapid change, businesses need choices. Intel enables that freedom of choice.

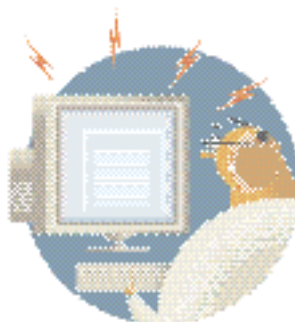
The key to collaboration is the development of industry-wide open standards and working closely with industry groups such as SEMI (Semiconductor Equipment and Materials, International). The 2,000-member trade association is helping vendors to design the next generation of lithography or other equipment that will im-

prove the process of making computer chips. Since the vendors—such as chip maker Intel—are members of the consortia, they are making sure they tailor their product designs to the customers' needs the best way possible: communicating with them and responding rapidly.

But you don't have to look to such high-ticket products as \$10 million lithography machinery to see collaboration. "Our engineers are getting more and more involved with our customers to make sure we give them what they want," says Phil Paino, president of seals manufacturer Greene, Tweed, & Co., which sells to the automotive, aerospace, medical, and chemical processing industries as well as to semiconductor equipment manufacturers. That customer involvement helps engineers understand customers' needs and problems, and is a reality check for making sure the product is right for the customer.

The case histories here show how some manufacturers are using PTC's software tools built on Intel architecture to

3 ways to collaborate



Enter often becomes a medium for collaboration as engineers across the globe share designs.

The traditional conference room is the place where engineers in the same company gather to review designs and design ideas.



State-of-the-art software and hardware enable engineers at different sites to view the same design models and discuss ways to make it better.

HERMAN MILLER

Suppliers join the team

Challenge: Collaborate with suppliers and external designers across the country

Enabling Technologies: Pro/ENGINEER, ProductView
Intel® architecture-based systems

Result: Part development time cut in half

Most people know Herman Miller as the manufacturer of the Aeron, arguably the most popular, high-performance office chair in the world, and often called the “perch of choice for tech firms.”

But Herman Miller, which generated nearly \$2 billion in revenue during fiscal year 2000, is also known for many other award-winning products. The company's designers create places to work by researching, designing, manufacturing, and distributing innovative interior furnishings that support companies, organizations, and individuals worldwide.

The company's design chain is scattered worldwide as well, which is why industry-leading engineering collaboration technology is vital to the company.

“In virtually every project we do, we are using external designers and suppliers and people are all over the country,” says Jeff Faber, manager of product development information technology at Herman Miller. “We are really dependent on our supply base, so we have to collaborate with them all the time, and they could be anywhere in the country or in the world,” he adds.



Engineers designed the Aeron chair using PTC's Pro/ENGINEER software.

Collaborative tools vital

The company has 150 designers and engineers using PTC's Pro/ENGINEER® who are mainly in western Michigan, but are also in design centers in Georgia, California, and Bath, England.

Faber says that the company has standardized on Pro/ENGINEER for all new product development, and has replaced other CAD tools with Pro/ENGINEER as it acquires companies. Of course, since Pro/ENGINEER can communicate with other systems, the company could have chosen to use the multi-system option, however, it opted for the superior functionality and ease of file sharing provided by Pro/ENGINEER.

What really makes collaboration vital for Herman Miller is the fact that all of the industrial designers working on Herman Miller designs are consultants. Faber says he will often arrange for Pro/ENGINEER to be installed on the consultants' systems to enable collaboration. He adds that the company has been able

to reduce its part development cycle time by 50% using Pro/ENGINEER.

One of the key technologies they are using to collaborate with their vast array of suppliers is PTC's ProductView™, a visual collaboration tool. The company is running the software on workstations powered by Intel® Pentium® processors. Faber says that by June all of their core, new development suppliers—about twenty—will have access to PTC's ProductView™.

“ProductView is going to help us a lot,” Faber says. “Our suppliers will be able to view 3D models, and mark them up and insert comments.” That allows Herman Miller to make changes early in the design process when they are the easiest and most cost effectively handled.

Faber's suppliers, using ProductView, can mark up or redline all types of product information and store and retrieve the resulting information. Markups can then be distributed over the Web. Among the results: real-time product review.

“Collaborating in real time is really going to help us going forward because we are so dependent on our suppliers,”

Faber says. “We think that by being able to collaborate with the best of the best, we're going to be able to get better ideas from more people and build on our ideas quicker to develop killer products.”

Says Faber, “The bottom line is, we are implementing technology to collaborate to leverage our suppliers' expertise to make a better product.”

Of course, all of the advanced technology needs the proper bandwidth. Faber says the company migrated from UNIX to Microsoft Windows® on Intel® architecture for its engineering workstations a few years ago.

“In terms of collaboration, the more network bandwidth, the better,” he asserts. “We're trying to keep up with the latest and greatest in order to enable this whole web collaboration. We're spending a lot more time on the web. We probably spend 50% more time on the web now than we did just one year ago. We expect that all our design review meetings will be on the web via tools like ProductView and Pro/ENGINEER.”

EMERGENCY ONE

Every vehicle a custom design

Challenge: Enable internal collaboration
automate custom-configuration process

Enabling Technologies: Pro/ENGINEER

Results: Flexible platform design
Rapid customization
Engineers focus on design, not finding ways to share data

The amount of collaboration that goes into the design and manufacturing of an Emergency One fire rescue vehicle is immense.

Emergency One, also known as E-One, manufactures virtually every type of fire rescue vehicle required by fire departments, rescue/EMS squads, and airports. The Ocala, Florida-based company makes products that include rescue transport/ambulances, quick-attack units, commercial and custom pumpers, tankers, rescues, hazmats, command vehicles, industrial trucks, aerial ladders, aerial platforms, and aircraft rescue firefighting vehicles.

Established in 1974, E-One grew to become the industry leader in less than 20 years, and today employs more than 1,800 people in five plants worldwide. E-One is part of the Fire Rescue Group of companies, which is part of Federal Signal Corp. Innovation has been the company's driving force and continues to be the impetus behind its pursuit of new technologies.

The vehicle's body is built in one location; ladders and platforms in another. Production schedules need to be coordinated, and purchasing and customer service need to be tied into the process as well. Add to this that there are literally hundreds of thousands of custom options available on any given vehicle, and the need for customer and manufacturing collaboration is "critical," says Jeff Aiken, manager, project planning group, Emergency One, Inc.

Because each fire truck that E-One makes is built to the fire chief's specifications, the need for E-One to have an automated design process is also critical.

"We spend a lot of time reconfiguring base models with the options that the fire chiefs want. Some of the options are regional, budgetary, or personal preference," Aiken explains.

The worldwide manufacturer's 100+ engineers and designers use PTC's Pro/ENGINEER® to include the result of their customer contact and collaboration into design of highly customized vehicles in a much shorter amount of time.

"Because there are hundreds of thousands of custom options, it's always a challenge to try to have options

pre-engineered and designed," Aiken explains. "What we're focusing on with Pro/ENGINEER is automating the custom configuration process. So when a customer orders a truck, they use our standard product book. The engineers use Pro/ENGINEER as a product tool to generate all the appropriate details."

E-One engineers and builds the complete vehicle: chassis, cab, body, tank, and aerial device. In light of that, there is a tremendous amount of collaboration that goes on just within the company. "And if we deal with our other three divisions, which we do, that brings in another level," Aiken says.

Their key to success was to organize layout through to design into flexible subsystems, to use powerful top down design tools that allow them to work with multiple designs and to work concurrently. This is critical to the success of managing product data.

"Everyone in engineering has access to our design drawings and models," he adds. "When the chassis guys are doing the chassis, the body guys can call them with questions. As each group designs their part of the new truck in 3D, we put it into a common system accessible to all." The result: Engineers can concentrate on developing great product without worrying about how to access and share files. PTC has made it easy for a distributed team to act as one.

Aiken adds that collaboration is also important when outsourcing with supplier partners.

And it is this collaboration and communication that is "key" to getting the vehicles delivered to their customers as quickly as possible, Aiken says.



E-One apparatus: ready for action thanks to PTC.

PENSKE CARS

Collaboration across the seas

Challenge: Enable collaboration between team members on different continents

Enabling Technologies: Pro/ENGINEER, ProductView
Intel® architecture-based systems

Results: U.S. and UK engineers access same models and data
Shorter design time

In the competitive world of car racing, precision is everything.

And for the engineers designing the racing machines for Penske Cars in the UK, they have an added challenge: the drivers are thousands of miles away in the U.S., where the cars will be fine tuned before any rubber comes into contact with the road.

But the challenge goes beyond the cars' design: They are also manufactured in the UK, and then shipped to Reading, PA, where the race team is based. Then, the engineering teams across the Atlantic from each other work together on a daily basis—via the Internet—exchanging information to get the car ready for race day. PTC's Pro/ENGINEER® and Intel help overcome these challenges.

"Being able to collaborate is very important," says Mike Bruce, systems manager for Penske Cars in the UK. "And being able to feed the information back from the track that's thousands of miles away is very important. We have a fairly small team in the UK, so we need to focus on issues that will improve the car's performance. The only way we can do that is to collaborate."

The design office in the UK has a total of nine engineers, including four mechanical engineers, two aerodynamicists, one finite element analyst, the head of engineering, and a chief designer. They have 10 UNIX workstations running Pro/ENGINEER. Their counterparts in the U.S. include four mechanical engineers and three electrical engineers.

In a classic example of internal collaboration, using PTC solutions, the engineers in Poole (UK) make their modifications. They use Pro/ENGINEER Advanced Surfacing to do the bodywork design, and use PTC's Manufacturing Solutions 3-axis machining techniques. They machine the bodywork from the Pro/ENGINEER model.

"Quite often, we can eliminate the CAD drawing,"

Bruce says. "We have a lot of confidence in the components that are designed with the Pro/ENGINEER CAD model. All of the suspension is designed with Pro/ENGINEER, and we use PTC's Pro/MECHANICA® to simulate the motion of the suspension system."

Ready to race

Once the car is shipped to the U.S., engineers there test the car, feeding the race process information electronically to the engineers in Poole on a daily basis. "They give us information such as performance gains or reliability issues that they have identified with the car that would result in it breaking down," Bruce says.

The information is communicated by e-mail with "lots of attachments and digital photographs," he adds.

This fast tracked information is immediately fed back into the process to speed production.

Meanwhile, the engineers are collaborating in two other ways: via the company's intranet and with PTC's ProductView™, which gives the engineers in the U.S. and UK access to all the drawings through a data base.

"Because Penske Cars is part of Penske Corp., which has a wide-area network (WAN), all of the engineers can access that network. There is an engineering data repository on the network,

and engineers can access all the Pro/ENGINEER models and drawings and download them," Bruce explains.

"Our goal is to have better access to engineering manufacturing information," he continues. "Obviously, there is a time difference from Reading, PA, to the UK. It's been a great advantage for engineers in the U.S. to have access to drawings after we've gone home. The races are on the weekend, and the office here in Poole is closed," Bruce says.

He says that the key to successful collaboration is leading-edge technology.



It takes international collaboration to design Penske racers.

INGERSOLL-RAND

Ingersoll-Rand gets more flexible

Challenge: Change from being a build-to-stock company to a solutions company

Enabling Technologies: Pro/ENGINEER, Windchill
Intel® architecture-based systems

Result: Lower costs
Shorter design time
Fewer change orders

For 130 years, Ingersoll-Rand (IR) was a “build-to-stock” company. But, says George Ashley, the company’s manager of engineering systems, “we are being asked to become a solutions-based company focused on the customer, engineering to order, and creating dynamic, flexible processes.”

To change its processes and culture, at first IR tried storing all documents and product-development information centrally, but doing so proved cumbersome. Custom solutions, on the other hand, were too expensive.

So, the company, which has standardized on PTC’s Pro/ENGINEER® for design, adopted PTC’s Windchill® for real-time collaboration.

IR’s goal was to double sales revenue and triple its stock price. The first step was to unite its diverse business operations around the world, in order to present a common face to customers, business partners, and suppliers—regardless of whether they

were associated with a Club Car golf cart, a Thermo King refrigeration unit, a Torrington industrial bearing, or a biometric security device from Recognition Systems.

For example, IR’s Club Car division will use PTC’s collaboration technology to improve coordination with its suppliers, increasing the quality of their industry-leading vehicles while reducing errors and changes.

The company’s Air Solutions Group uses PTC’s Pro/INTRALINK® and PTC’s Windchill and coordinates nine engineering and manufacturing sites in China, Italy, the UK, the US, and India.

IR says its implementation of the integrated PTC solution (which includes Pro/ENGINEER, Pro/INTRALINK, and Windchill) is enabling it to project annual cost reductions of more than 5%. IR has also been able to cut cycle time and change orders.

streamline internal processes for collaborating internally and externally.

Outsourcing requires close collaboration

In addition to colleagues within their own companies, engineers regularly have to collaborate with many others, including suppliers and—occasionally—competitors. “Coopetition” is becoming commonplace, says Bruce Jenkins, executive vice president of research firm Daratech.

And then, there is the need to collaborate with all the suppliers that manufacturers may outsource to. Market research firm, The Aberdeen Group, estimates that manufacturers outsource up to 70% of their product-development activities to external suppliers, contract manufacturers, and contract design services companies. Other sources put that number at 80%. There are logical reasons for companies to outsource.

“Shortening product cycles, time to market, and time to profit are big drivers of business today,” says Jenkins. “Re-

deploying assets through outsourcing is an important way to accomplish all of that.”

Nearly half of the engineers in the appliance, automotive, off-highway, office equipment, and communications industry responding to a recent Design News survey said they are outsourcing design work more now than they did five years ago. And they are sending that work to design firms, supplier companies, and systems integrators, among others.

Collaboration provides a definite business and product advantage. Examples abound at companies of all sizes:

- General Motors, for one, realized that it needed a partner to help develop the Night Vision system for the Cadillac DeVille. GM engineers turned to defense contractor Raytheon, which had developed the technology for the government, and outsourced some of the design to that company.
- Europe’s \$17.2 billion Airbus consortium, which directly employs over 3,000 staff from more than 30 different nationalities at its Toulouse, France, headquarters, has found ways to get everyone working together. “Engineers there are in different countries with different cultures

BAE SYSTEMS

BAE SYSTEMS aims to get faster

Challenge: Improve information flow between engineers, suppliers, and customers

Enabling Technologies: PTC MCAD Solutions, Windchill
Intel® architecture-based systems

Result: Faster delivery times
Closer relationships to customers

As a prime contractor to global defense agencies, and the world's second largest defense manufacturer, BAE SYSTEMS' product line runs from military aircraft to nuclear submarines, and involves hundreds of suppliers, thousands of documents, and decades-long product lives. Every new contract brings a new set of suppliers, all with their own enterprise manufacturing and financial systems, unique reporting requirements, and proprietary processes. It could take months for information to travel between engineers, fabricators, managers, and customers.

So, BAE, which uses PTC MCAD Solutions for CAD, opted to also use PTC's Windchill®. "It was the only system that did everything we wanted," says Paul Johnson, the company's program director for Windchill implementation. Before Windchill®, a fabricator or assembler could

wait three to four weeks before a question worked its way from the shop floor to senior management and back. By providing real-time access to information all along the supply chain, Windchill speeds delivery schedules, and provides close customer relationships.

"Windchill will give our customers the ability to monitor progress at will and become much more intimately involved with the design/build process," says Johnson. "Real-time communication will reduce rework and help identify potential modifications, improvements, or savings when there's still time to do something about it."

Moreover, says Group Managing Director-Operations Rod Leggetter, "many things that used to take us eight weeks we intend to do in one. Competitively, that kind of speed will give us a real advantage."

and languages, and they compete in the defense area," says Brian Shepherd, senior vice president technical marketing at PTC. "But, they work together on the commercial aviation level, sharing parts of the overall plane design, thanks to the software they use."

- Intel is the world's largest chip manufacturer and the world leader in online revenue, taking in more than US \$2 billion each month through its B2B e-Commerce system. So they know the pains and opportunities of collaboration and rapid product cycles first-hand. Intel built a worldwide e-Commerce infrastructure in 1998 that enables the company to interact with its customers—particularly OEMS, distributors and resellers—through the Internet. Among the business results? Seventy five percent of engineering customers cut a week out of their development cycle and confidential documents are now delivered in less than 30 minutes. Before, it was two to three weeks. When it comes to Intel's own manufacturing processes, "we have a time-based collaboration that supports the new product pipeline," explains Tom Gibbs, Intel's Director of Worldwide Industry Marketing. "We have design teams that can share computational horsepower among our design sites in Portland, Israel, Phoenix, Santa Clara and Sacramento."

- Seattle-based design firm Stratos Product Development recently collaborated with suppliers as it worked on the design for the SportBrain, a personal fitness machine the company designed entirely in PTC's Pro/ENGINEER. Engineers exchanged CAD files with component suppliers throughout the design process.
- Kenworth Trucks, a division of Paccar, has design teams in different parts of the world that can exchange information among design centers, thanks in large part to their Intel® infrastructure and PTC software. In fact, Kenworth runs almost completely on Intel. Kenworth truck engineers in the US hand off a snapshot of their design work at the end of their day to engineers in India. They in turn hand off a snapshot of their work at the end of their day to Kenworth engineers in London, who at the end of their day, pass the design back to the U.S. "We have seen a lot of companies employ this kind of 'round-the-clock' design strategy," say Gibbs. "They have expanded the product design and development information they share, and it shows in how they have accelerated time-to-market."

Gibbs says that Intel views PTC as a forward-looking company that is developing software that enables companies worldwide to easily share information. For example, he says, Hutchinson Technologies, the leading worldwide supplier of

suspension assemblies for computer system disk drives, is using PTC's Windchill® on Intel-based servers to enable engineers to collaborate on designs, share model data, and shave time from their design-to-manufacturing cycle.

A role model for companies that want to leverage technology in this new world of engineering design, Intel has invested about \$2 billion in e-business services and solutions. The company conducts nearly 100% of its business over the Internet. And, it offers a range of services, products, and technical support to help other companies adopt e-practices.

Among those benefitting from Intel's help with e-collaboration is a disk-drive manufacturer that cut its cycle time from six months to three months. That same customer increased its market share by five points.

"Customers' desires are always changing," says Gibbs. "One of the biggest benefits to e-based collaboration is that manufacturers can deliver to customers what they want as soon as possible."

Of course, to collaborate effectively, manufacturers need the right tools, including software that uses the Internet as a platform to help engineers work together. Says Daratech's Jenkins, "The IT solutions that manage collaboration are important." They are the enablers of the essential sharing of information critical to the new world of engineering design.

But it doesn't end there.

As important as the tools are, the internal processes within a company are critical to collaborating successfully. "The walls between design and manufacturing have to come down, and I believe they are coming down," says Jon Stevenson, executive vice president and general manager MCAD at PTC.

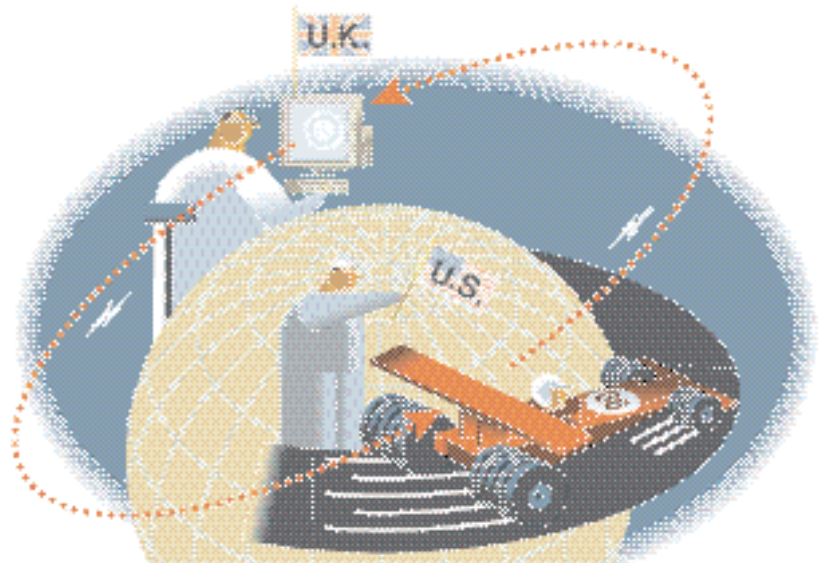
The future is now

The challenges manufacturers face today to cut costs, customize designs rapidly, and get it all done right the first time are only going to intensify in the years ahead.

The only way they'll thrive, let alone survive, will be to collaborate internally and externally, bringing together the best ideas for each product design to optimize the design and get it out the door.

As all of the case histories here show, manufacturers are collaborating their way to success. It's what makes them more competitive—it enhances product quality, opera-

The global link



Manufacturers often have globally dispersed suppliers, customers, and business partners all of whom have to be able to share ideas as they optimize products from appliances and racing cars.

tional excellence and ultimately drives up revenue. As global companies, both Intel and PTC are helping customers of all sizes with the capabilities they provide for global modular product platforms, design customization, design for product confidence, engineering and team productivity, product data management, real-time model review, and heterogeneous design tools.

PTC and Intel will sponsor a special Webcast

PTC and Intel will sponsor a special Webcast on Design Collaboration June 27, 2001 at 11am (EDT). The Webcast will discuss why collaboration is so essential in engineering today and how manufacturers are enabling their engineers to collaborate with colleagues across the hall, across the continent, and across the oceans.

Speakers will include industry analysts and engineering managers who have successfully implemented collaboration processes. *Design News* National Editor Paul E. Teague will moderate the discussion.

Register for the Webcast at www.designnews.com.

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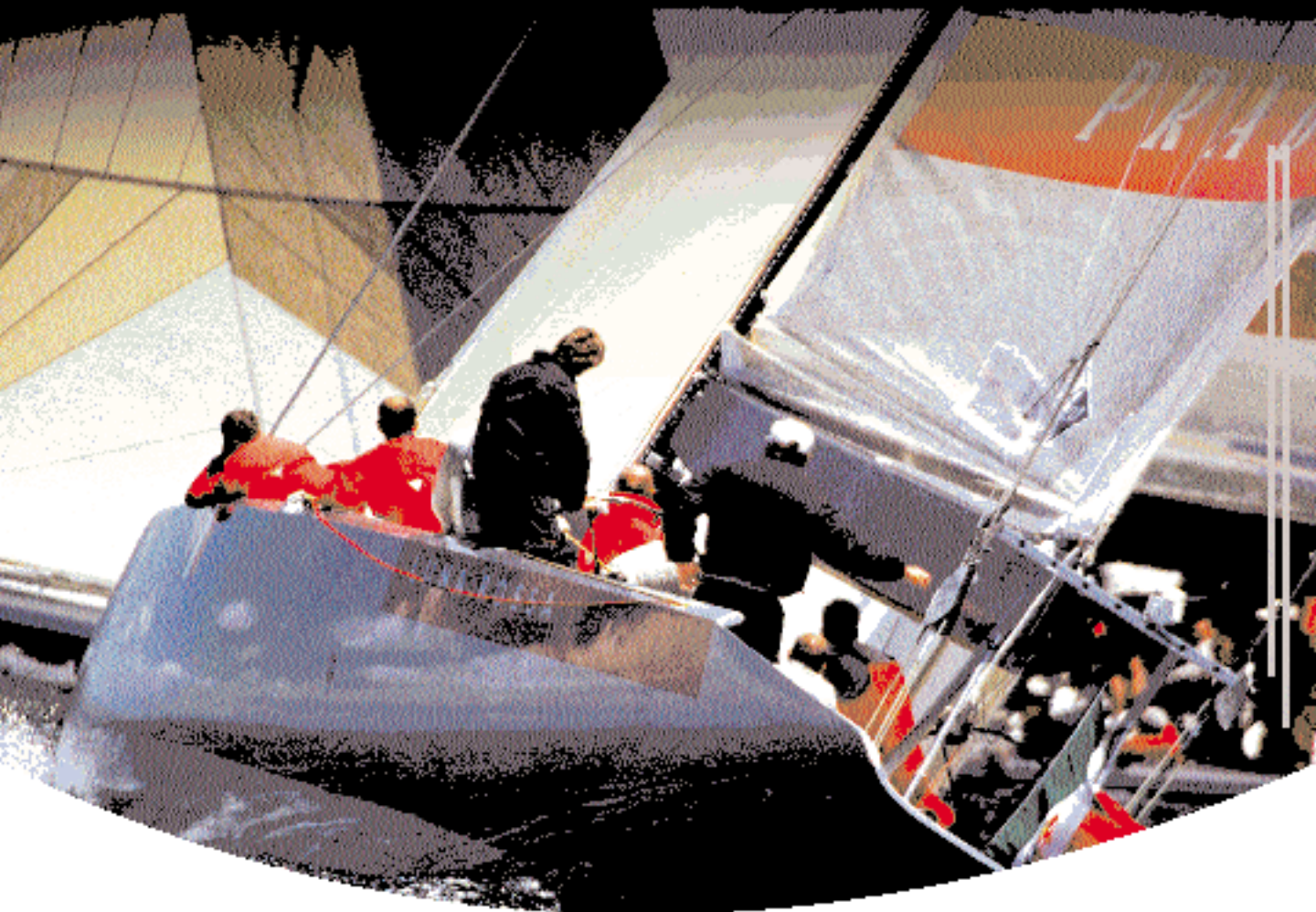
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