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October 2006 Volume 2 Issue 10

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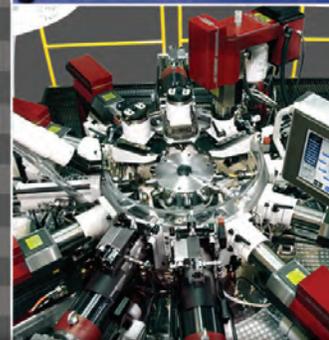


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Today's Machining World

October 2006 volume 2 issue 10

# Meet you at 10 in South Bend

The Air Taxi Age Approaches

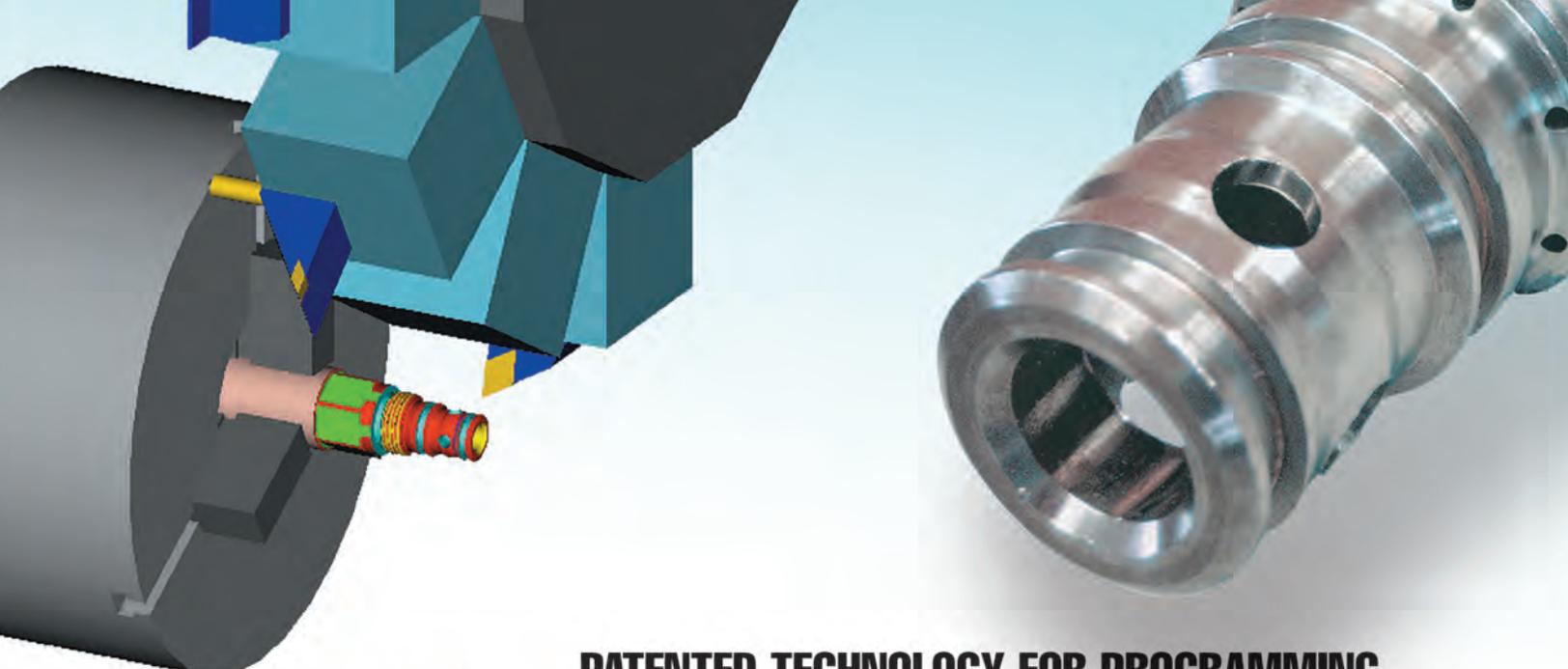
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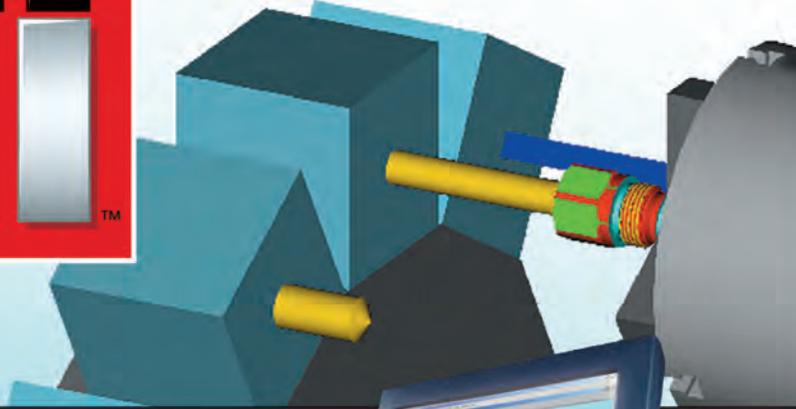
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## editor's note

### Basketball Diary

**B**ack in the day, I was a good basketball player – a shooter without a conscience. When I had the hot hand, I was always looking for my shot.

My hoop dreams are over – bad knees, no hops, too fat and six eye surgeries. Haven't touched a basketball in two years. I suffer from double vision and constant glare, which makes my depth perception suspect.

I was at a family reunion recently, where basketball was a centerpiece of family bonding. My sons played, and I was happy to be a rooter. After the full court games, some of the guys started playing HORSE, and I couldn't resist the urge to try a couple of shots.

The feel of a leather basketball arching out of my fingertips is still one of my sensual velvet joys of perfection – etched into my tactile memory 'til I die.

I started shooting and felt my release was a little off. I was wearing sunglasses, which cut down on glare and double vision. A few shots later, the release clicked in, but every shot was short. I realized I was trying to *look* the ball into the basket. With my damaged eyes, I had to *feel* the ball in, not look it in. I forgot about the rim and just “felt it,” and the shots started to fall. I hit a dozen shots in a row.

It was a delicious reminder of the fallibility of the conscious mind and the stunning power of the unconscious.

I also find this in writing. When I outline a piece, I usually get stuck. When I let the idea write the piece, it works. I once read a brilliant book by Natalie Goldberg named Writing Down the Bones. Her thesis is that we must allow the pencil to write the story – writing fast, almost without thinking.

Reworking can come after. Just get it down on paper. Allow it to happen. Let your talent come through.

So often in business, we think ourselves into a pickle. The basketball analogy usually works. Don't look at the hoop – just “feel it.”

Lloyd Graff  
Editor/Owner

editors note

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### Female Perspective

When I got my July issue of Today's Machining World, I read your editorial at the beginning about the lady who gets your magazine and doesn't read it. I just wanted you to know that your magazine is basically the only work-related magazine I read. I really like all of the different articles about different people, as well as the puzzles. Since I am one of the few women in the field, I liked the article about women, although the pictures were a little scary since the women had jewelry, long sleeves and no safety glasses on. We are in the honing business, and I am an R& D model-maker. I mostly run Mazak lathes and machining centers, although I do run a lot of manual machines. My favorite is the Mazak 250MY that has live tooling and a Y-axis. It is a kick. I am hoping we get an Integrex someday.

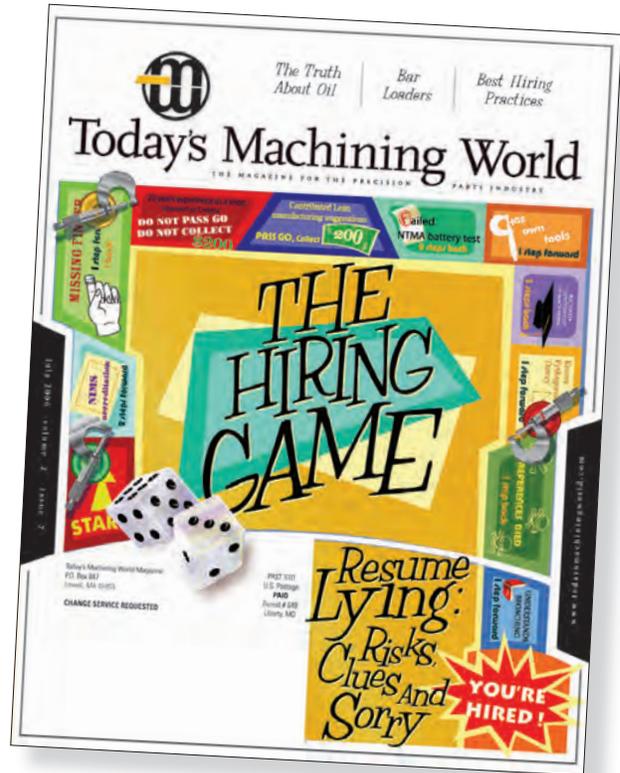
Anyway, I didn't want you to feel too bad about the gal who didn't read the magazine.

Tamara Hawn  
Sunnen Products, St. Louis, MO

### Raves from Rutland

I am not sure if this puzzle solution is being sent too late or not, because I have been out of town for a while and just picked up my August issue of TMW late last week. I read the magazine cover to cover every month, and I am very pleased with every aspect of the publication. If possible, please tell the entire staff thank you for me. It is a treat to get my issue each month.

Eric Gould  
Gould Engineering and Machining, Rutland, VT



Eric: Thanks for the compliment. In this issue, we are reprinting August's puzzle answer, as well as all the additional names of people who submitted answers to it. November's issue will contain September's puzzle answer and names. We got tired of having to turn people down for recognition because they were late—when really there was just too little time between issues. Still get your puzzle answers in early, but know that you've got a little more time now!



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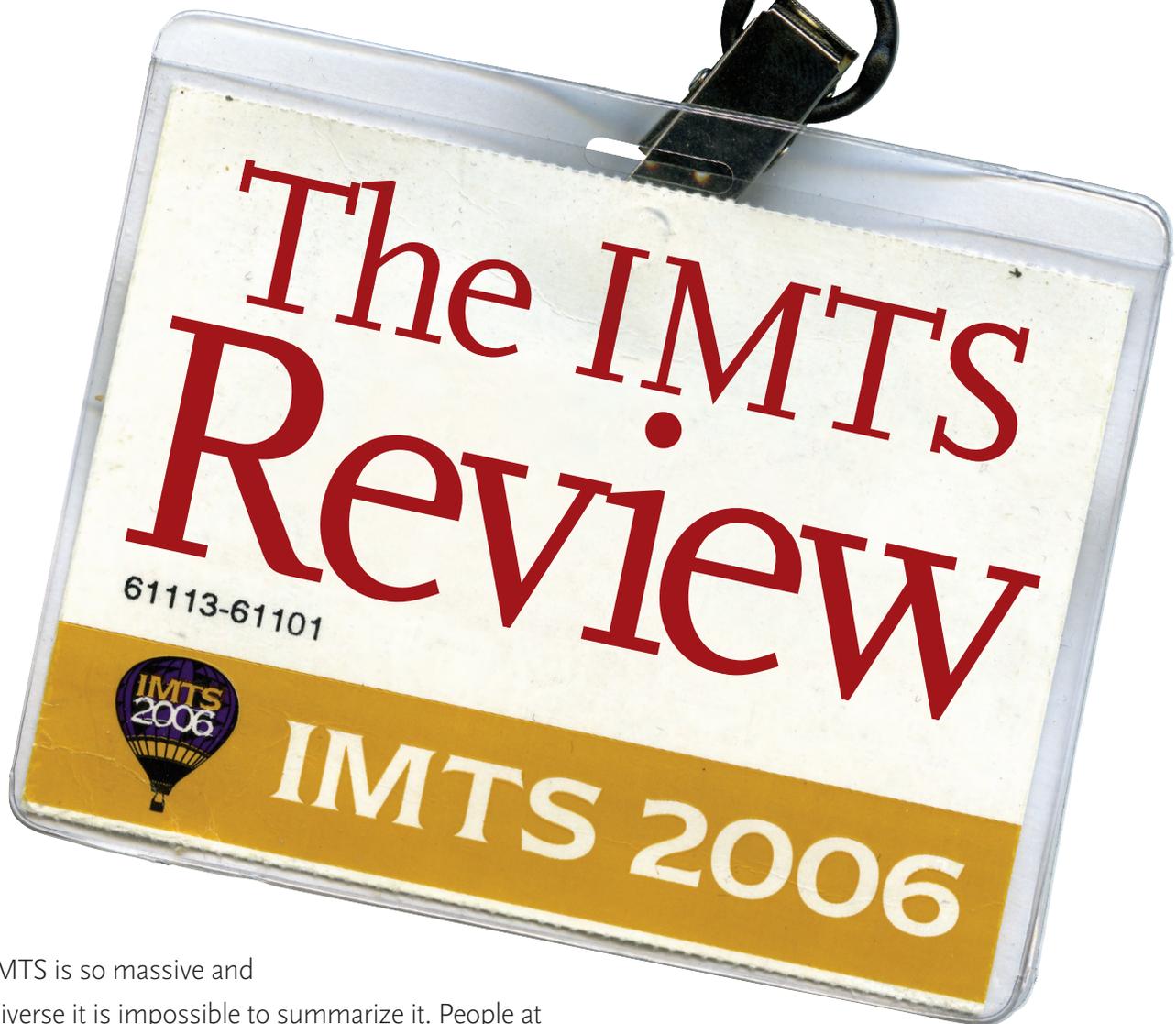
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IMTS is so massive and diverse it is impossible to summarize it. People at the show would often ask me, “How is IMTS?” and I would blather an innocuous riddle to deflect the question. I made a promise to myself before my self-imposed eight days of IMTS immersion to “feel the show” rather than just intellectualize and enumerate stuff about the exposition. This is my short “feel” for IMTS, incomplete, shallow and personal.

This was a happy show. Virtually everybody was upbeat except the surly badge checkers I encountered entering each hall. The visitors were in a great mood and the exhibitors gave off good vibes. Even as the show moved toward conclusion, I sensed that people were having fun. Personally, I

hated to see IMTS end. I had written on my new blog ([www.swarfblog.com](http://www.swarfblog.com)) that the show should be shortened to three or four days. I officially renege on that view. I think six days will be perfect in 2008. Three days is a show – six days is a festival.

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**Nobody talked about** China. Outsourcing to China is a fact. Globalism is a fact. Closed factories, transitioning automotive, bumbling Billy Ford were a backdrop for IMTS 2006, but not the focus. People came to shop and educate themselves about manufacturing today and tomorrow. They were not dwelling on the past. The visitors were a self-selecting sample, of course. The traumatized, the victims, the paralyzed did not pay a lot of money for the privilege of schlepping around McCormick Place to hear the latest spiel about new hardware and software.

**Everybody is worried** about the depopulating of the machining world except Fanuc, which is selling a ton of robots, helping to accelerate the trend (see Afterthought). Where there is a big problem, there is big opportunity. This is a nice time to be looking to improve yourself if you are willing to move and possess skills. The oil and gas world is desperate for people, and so is medical. Everybody is interested in pulling the rust belt refugees to Wyoming or Florida or Shanghai. The headhunters are offering \$150,000 a year for two-year commitments to duty in China, I hear. But you don't collect it if you leave early.

**During the show,** Bruno Schmitter of Hydromat formally announced his company would represent the Tornos multi-spindle line. This is an important product extension move because he can now offer both a rotary transfer and a screw machine solution to customers. Tornos makes a beautiful, technically-advanced CNC multi and the popular SAS 16.6 model.

Tornos in Connecticut will continue to sell the single-spindle, for which they have a new president in Scott Kowalski.

Hydromat's challenge is to rejuvenate a brand that has been out-marketed by Index and Schutte for several years. They will have to cut through any confusion over the splitting of the representation of the two Tornos lines. Hydromat has no desire to sell the Swiss CNC because it believes it would jeopardize its Edge division's position in barloading, and Tornos is committed to the single-spindle line in America.

swarf

**The one IMTS exhibit** that blew me away was that of Ex One. Founder Larry Rhoades and his team really believe that they are changing the machining world with their technology, which combines 3-D digital imaging with a metal powder layering approach and an inkjet style “printer” to “build” product. They have a viable sand mold machine and are beta testing a machine to “print” gold crowns for teeth. They are awaiting FDA approval. We may commonly see this product in dental offices before IMTS 2008. (See my swarfblog for more, including a video). Rhoades envisions a world with a diminishing need for scrap, oils and carbide tools scraping metal. He sees a world where manufacturing will be where it is needed and Fed Ex will be a much smaller company.

Larry Rhoades is no ivory tower theorist. He owned Extreme Hone, and his CEO Jack Burns was president of Gleason Works. These guys have vision, money and a huge market opportunity. This could be Xerox times 100.



**The speculative** commodities hula hoop has slipped to mid-butt. Sorry, no \$100 a barrel oil this year, no \$4 a pound copper, \$3 a bushel corn. We're headed down the commodities slope and I think this is good news, except for Texans and Chileans. If the political and Katrina risk was \$30 a barrel at \$75, we're probably headed for \$50 soon. This takes the pressure off Uncle Ben at the Fed. Receding federal budget deficits mean a stronger dollar, which also weakens commodity prices. Mortgage rates have flattened already, but housing demand is still weak, especially in Florida and Arizona. Put it together and it smells like soft landing for the economy. The stock market rebound tends to reinforce that view.



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The November election means little for the economy. Bush has been pitiful on pork; Social Security reform is DOA; and if the Senate stays Republican, we'll have healthy gridlock for two years. The Democrats seem utterly fixated on W.; so, even if they take both Houses of Congress they'll fritter away their two years in the sun trying to impeach George the 43rd, or if that fails, sending him to Guantanamo for a long vacation.

One of the loony rumors circulating is the hookup of GM and Ford. I'm predicting that one after the Christian-Muslim merger is brokered by Goldman-Sachs. I do think a private equity firm may take a run at either auto problem child because the potential fees are just incredibly juicy. The Ford family might finally sell out, figuring that a slice is better than Billy burning the loaf. The new guy from Boeing, Alan Mulally, could be painting the Dearborn walls to impress the buyers.

Perhaps the biggest financial story of 2006 is the ascendancy of the private equity buyout. The amount of money available to private buyers is staggering – estimated to be over 1 trillion dollars. We're talking about 1000 Fords, and I'm not referring to Taurus. Most of the large scale takeovers are attempts to flip companies to bigger fools or transform them into public entities, enabling the leveragers to bail. Growing the business is secondary to making the

business "look" healthy to the unsuspecting next investor.

Some buyouts do make economic sense. Perhaps a buyer is looking for a key person, or fresh technology. Sometimes a purchaser brings new energy to a tired company. A Warren Buffet looks for healthy companies seeking liquidity and finds them.

But mostly I see fast buck dudes who shuffle companies, looking for the fees without regard for the long-term future of the business or the stakeholders.

It's an unhealthy trend. Perhaps someday we'll get legislation or regulation to mitigate the abuses.

Today, there is money out there looking for, yes, manufacturing businesses. Even machining. There is roll up money and foreign money looking to buy American companies. They are looking for access to customers and expertise. The weak dollar makes these firms even more attractive. The big shake out in American manufacturing is far from over. The buyout guys are going to accelerate it with a twist.

**ebay has lost its love** in the merchant community, and it is looking to find it in all the wrong places.

Much of the attraction to eBay is the auction mode where there is an opportunity for both the buyer and the seller to

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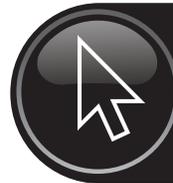
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make a score. The auctions built eBay, but they are losing their appeal. Professional sellers fear the randomness of an auction for an unusual item at one given point in time. For a machinery dealer like Graff-Pinkert & Co., the sister to *Today's Machining World* magazine, selling without a reserve or high starting price seems foolhardy on its face, but it appears to be the only way that we can get action on the site. The eBay store is advertising, but we hardly ever sell anything off of the store. Graff-Pinkert attempts to jumpstart auctions with email and fax announcements because we do not trust eBay to generate the traffic we need on our machinery and tooling items.

Our buyers usually come from people on our lists, but new people do keep popping up who we've never heard of before. I feel our auctions would be more effective if other sellers in the field trusted the auction model. This would bring more interested buyers to the site. eBay's management knows that the auctions are the heart of eBay, but the stores are the Golden Goose. Management is happy to take the big store advertis-

ing dollars, but the energy comes from the auctions, which are becoming stale.

eBay is raising the store fees to try to move the sellers to auctions, but the result may just be more merchant irritation.

Wall Street prefers the store advertising approach because it appears more predictable, but it will eventually sap the soul of eBay, which is the auction action.

An area where eBay has also failed the merchants and buyers is in its security. The auction site is brutally hacked. Every bidder on a large ticket item who is unsuccessful receives clever second chance come-ons, which are totally bogus frauds. eBay's purchase of Skype, the voice-over-internet protocol software, sent a message to me that Meg Whitman and the eBay board had lost faith in the basic eBay business and were desperate to invest in the "next big thing" while they still had a highly valued stock currency.

Personally, I think the money would have been better spent on securing the site and promoting the original auction concept.



Art by Wilford Terscha.



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**My friend Stanley** lives for laundry. He is a young entrepreneur who brings his intellect and creativity every day and night to his sliver of a laundromat in a strip mall in Homewood, IL. The local Starbucks and Panera Bread stores are the offices where he plots his forays into the lucrative land of institutional laundry.

Hospitals are the Valhalla of laundry. A decent sized hospital has a million dollar a year laundry tab. Stanley says once you get into a hospital's billing system, it takes explosives to evict you. So how does a tiny strip mall laundromat shop get into a gigantic hospital? Cold calling? Knocking on doors? Direct mail? Hopeless. But Stanley feels like he has found the key—mops.

Hospitals use a lot of mops, and mops must be laundered every day. Institutional laundries tend to throw the mops in with the sheets when they return them to hospitals. This means lots

of wasted time by housekeeping to fetch their cleaned mops. Stanley, the mop cleaning specialist, will return the mops clean and segregated to the place where they are needed. These days, Stanley takes his digital camera on deliveries to document the waste of bundling mops and linens. He plans to illustrate his better approach to ten local hospitals. One hospital's mops are a \$700 week account, a pittance to an institutional laundry, but a nice account for Stanley. But the most important piece of the mop business is that it gets him into the hospital on a regular basis to build his relationships and credibility. And once you are in the billing system...

Every big company has a wedge, a dirty mop, that is begging for a better way. Stanley will eventually get the mop business at several of the local hospitals, not on price or even connections, but because he showed the tenacity and the creativity to scope out his opening. And one day, the soggy mops will lead to linen business.

Next time you think there is no way to pry open the door of a big account, consider my friend Stanley and the beautiful, soiled mops.



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## *FUTURE TECH Innovations In Transportation*

Futuristic transportation has fascinated engineers, designers and artists for centuries. Leonardo Da Vinci designed airplanes four hundred years before the Wright brothers. Today, comfortable, reliable cars and high speed trains offer fast, safe travel, and jet planes connect the globe.

Nevertheless, today's transportation marvels have tradeoffs. The world now faces congestion, pollution and diminishing energy reserves. As these problems loom, society is turning to more creative science and technology for solutions. Future Tech: Innovations in Transportation by Paul Schilperoord explores the history of land, air and water travel, and looks into the future, basing its predictions on concepts and prototypes currently in development by companies.

SkyTran is a concept for high-capacity, high-speed personal rapid transit developed by my good friend and high school classmate, Doug Malewicki. The system operates with individual 2-seat vehicles suspended from elevated guideways – not unlike Chicago or New York's elevated trains – but better looking and almost noise-free. With SkyTran, travelers enter vehicles at a station and program in a destination. The maglev-powered (magnetic levitation) car accelerates into the main grid, whisking passengers to their destination at speeds up to 100 mph. A German company, Transrapid, installed a maglev system in Shanghai, which operates at 280 mph, and Central Japan Railway operates a prototype superconducting maglev train at 340 mph.

Examining land transportation (personal vehicles and mass transport), Schilperoord's book discusses electrics, hybrid electrics, fuel cells, and steam and air-powered vehicles. Interestingly, automobiles were originally electric and steam-powered, but gradually those models disappeared as gasoline-powered internal combustion engines proved to be a better system.

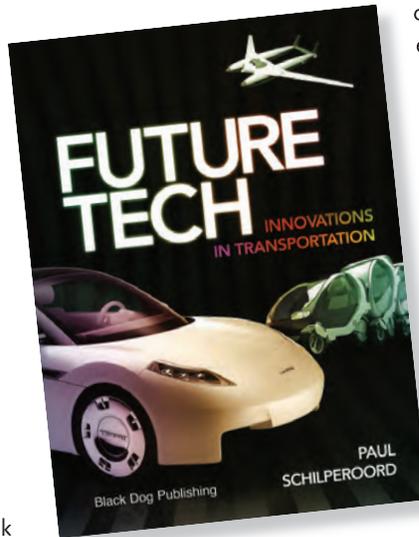
The main technical disadvantage with electric cars has been slow recharging and limited range of heavy batteries. Even though battery technology has rapidly advanced in recent years, advances have generally been for small size applications like watches and computers. Scaling-up to a system large enough to power a car

increases the problems. Imagine a small lithium computer battery fire magnified to a car fire, which not only would destroy one's car but also their garage and house too. Yet future development of all electric cars is possible. Schilperoord discusses the Eliica (electric lithium-ion battery) car developed at Keio University in Japan. It seats five and can attain speeds of over 200 mph. At slower speeds, it has a range of 200 miles.

Hybrid electrics provide a means to solve recharging and range problems and are already commercially available from Japanese manufacturers. Future hybrids will feature plug-in recharging and possibly solar panels. Eventually, the hybrid's internal combustion engine may be replaced with a fuel cell. Several auto companies are developing hydrogen-powered concept cars, but cost is still prohibitive, and a fuel supply system is not in the foreseeable future.

Speed and comfort for longer distances are being provided by high speed trains. Also, both Mercedes-Benz and a Dutch company called RET have just started producing high capacity (200 passenger) automated bus systems. On the U.S. front, M.I.T. is pushing the concept of fun little electric city cars for use in dense urban areas. These cars can be stacked throughout the city and rented inexpensively, then dropped off at other stacks.

Only time will tell whether the concepts presented in Schilperoord's book will reach fruition, but it is fun to see what is currently on the drawing boards around the world. Success ultimately depends on available energy sources, environmental protection, and most importantly, consumer appeal and acceptance.



Comments? You can email Jerry at [jerroldlevine@yahoo.com](mailto:jerroldlevine@yahoo.com).

fresh stuff



## Gravity Driven

Mori Seiki's new NH5000 DCG™ horizontal machining center features Mori Seiki's trademarked DCG (Driven at the Center of Gravity) technology. Mori Seiki states their DCG technology yields reduced residual vibration, which facilitates a rapid traverse rate of 164.04 feet/min. Feed accelerations on the X, Y, and Z axes are 1.0 G., 1.1 G., and 0.7 G. respectively, which is twice as fast as previous machines. The B-axis employs the Direct Drive motor system, which permits a 90° indexing time of 0.62 seconds. Axis travels are set at 28.74" for the X and Y axes, and 33.46" for the Z-axis. Spindles can be selected from the No. 40 or No. 50 taper types.

For more about Mori Seiki, please call 847-593-5400 or visit the company website at [www.moriseiki.com](http://www.moriseiki.com).

## Dual Action

Fuji's new ANW-3500 is a mid-range twin spindle lathe that accommodating heavier workloads, larger machine envelopes and higher machine powers and torques than its ANW-3000, while coming with a lower price tag than its ANW-4100.

Applications for the ANW-3500 include large hubs and smaller diff cases, as well as disk brakes and rotors. The ANW-3500's dual spindles operate at 25/20 HP power each (20/25 optional). An A2-6 spindle nose comes standard; an A2-8 spindle nose is available as an option for larger size chucks (12" – 15"). The ANW-3500's new swing arm robot can handle up to 7kg (15.4 lbs) of parts, and operates with the same CNC and robot control as the ANW-3000. For an improved machine envelope, the Z-axis stroke has been extended by 75mm. The ANW-3500's work size is 250mm x 4.33.

For more information, please contact FUJI Machine America Corporation at 847-821-7137 or visit the company website at [www.fujimachine.com](http://www.fujimachine.com).



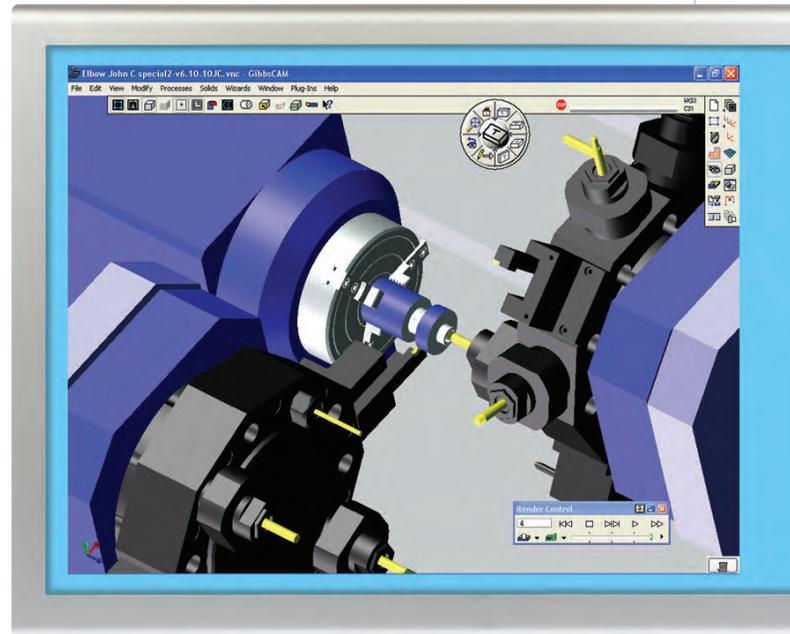
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## Four Squared

Kitako has introduced the MT4-85 Horizontal CNC Lathe, offering four-spindle technology. With their "load while machining," loading time is minimized; the company states the lathe offers as much as three times more productivity than conventional CNC lathes.

Parts are transitioned in and out of the machining zone in as little as .8 seconds each. The MT4-85's four spindles are mounted in a horizontal, square pattern in a large carrier drum. The drum's positioning accuracy is ensured by a large diameter, precision-toothed, curvic coupling. Spindles are generally partnered as pairs so as the carrier is indexed 180 degrees, two spindles rotate to the machining area as two spindles move out for loading and unloading. The two spindles in the machining zone, along with the respective slides and turrets, work simultaneously as well as independently.

For more information, contact SB Machine Tools at 847-882-9600 or visit the company website at [www.sbmachinetools.com](http://www.sbmachinetools.com).



## Virtually Simulating

Gibbs and Associates now offers GibbsCAM Machine Simulation capability, which complements GibbsCAM Cut Part Rendering process simulation functionality. This feature allows for entire machine tool motion of a CNC program to be validated in an accurate simulation. This version adds support for turning, mill/turn and multi-task machine tools. Machine tools models can be built and setup like the real machine tool. The CNC program is then simulated to validate it prior to running the CNC program on the actual machine tool. Not only does this allow potential programming errors to be visually identified before they become very expensive mistakes out on the shop floor, but program inefficiencies can also be recognized and addressed.

For more information about Gibbs and Associates, please call 800-654-9399, or visit the company online at [www.GibbsCAM.com](http://www.GibbsCAM.com).

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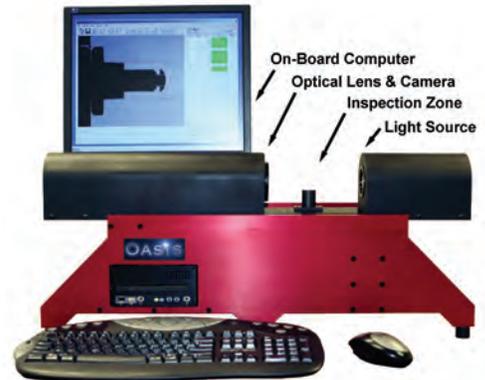
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**Smart Parts**



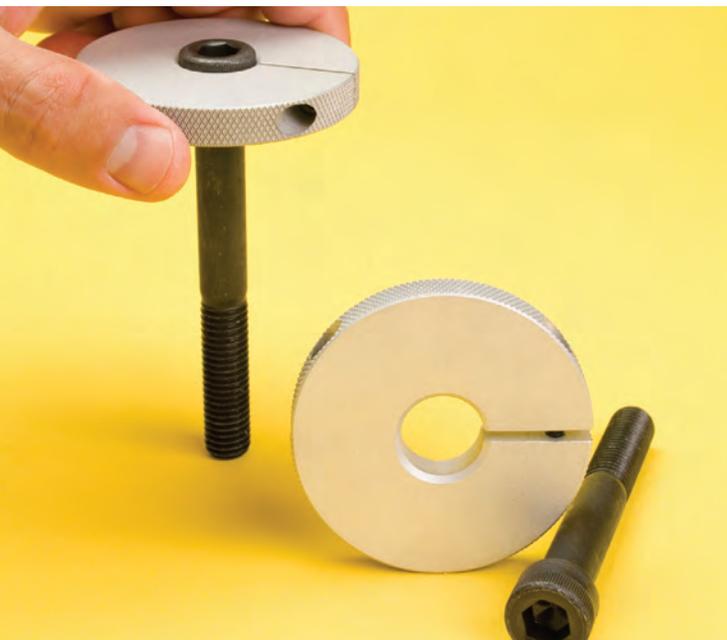
George Products Company, Inc. is now offering the Oasis (Optical Automatic Smart Inspection System) to their "Pobin" line of portable inspection devices. The Oasis is a full-featured, non-contact video profile measurement and inspection system allowing users to measure multiple dimensions on a part simultaneously and instantly.

The Oasis operates by casting a "Shadow" of a part to be inspected and capturing that image in a digital format to be analyzed by an on-board computer. The software converts the captured image into real dimensional data that measures the part to an accuracy of 0.0002-inches. The Oasis features built-in quality control inspection reporting. Measurements taken by the Oasis are recorded in the unit as parts are inspected. Those dimensions can be imported into the Oasis Inspection Reporting feature that can be printed or saved in the Oasis for future retrieval.

For more information please contact George Products Company at 302.449.0199 or visit the company website at [www.pobin.com](http://www.pobin.com).

**Nut Buddy**

A new knurled, clamp-on wrench that fits over a socket cap screw to turn it into a large knob that permits rapid tool changes has been introduced by Stafford Manufacturing Corp. The Nut Buddy™ for socket cap screws is a knurled, clamp-on wrench that converts any socket cap screw into a large knob to allow spin on and spin off adjustments. Permitting rapid tool changes, this compact wrench can be hand tightened but still allows for conventional wrenches when high torquing is required.



The Nut Buddy™ for socket cap screws is machined from aluminum, has a round bore to fit socket cap screws from 1/4" to 1/2" diameter and an anodized finish. It is also available with a hex bore for use with hex nuts and hose fittings. The Nut Buddy™ for socket cap screws is priced from \$15.84 (list). Literature is available upon request.

For more information please contact Stafford Manufacturing Corporation at 800-695-5551 or visit the company website at [www.staffordmfg.com](http://www.staffordmfg.com).

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For more information please contact Lund Coating Technologies, Inc. at 901-853-4761 or visit the company website at [www.lundonline.com](http://www.lundonline.com).

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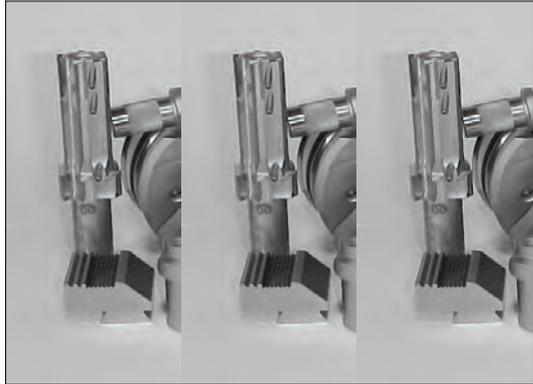
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For more information, contact Sumitomo Electric Carbide, Inc. at 800-880-0619 or visit the Sumitomo website at [www.sumicarbide.com](http://www.sumicarbide.com).

## Blazing Blaser

Blaser Swisslube, Inc. has announced the addition of Vasco 5000 metalworking fluid. This product contains vegetable oil-based esters, which are renewable raw materials with excellent skin compatibility for machine operators. Vasco 5000 offers long sump life. The rinse behavior of this product is low-consumption and leaves cleaner machines and parts. Vasco 5000 is applicable for machining titanium, stainless steel, cobalt chrome and other difficult to machine materials.

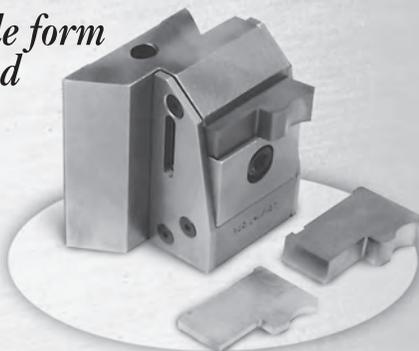
For more information about Blaser Swisslube at 845-294-3200 or visit the company website at [www.blaser.com](http://www.blaser.com).

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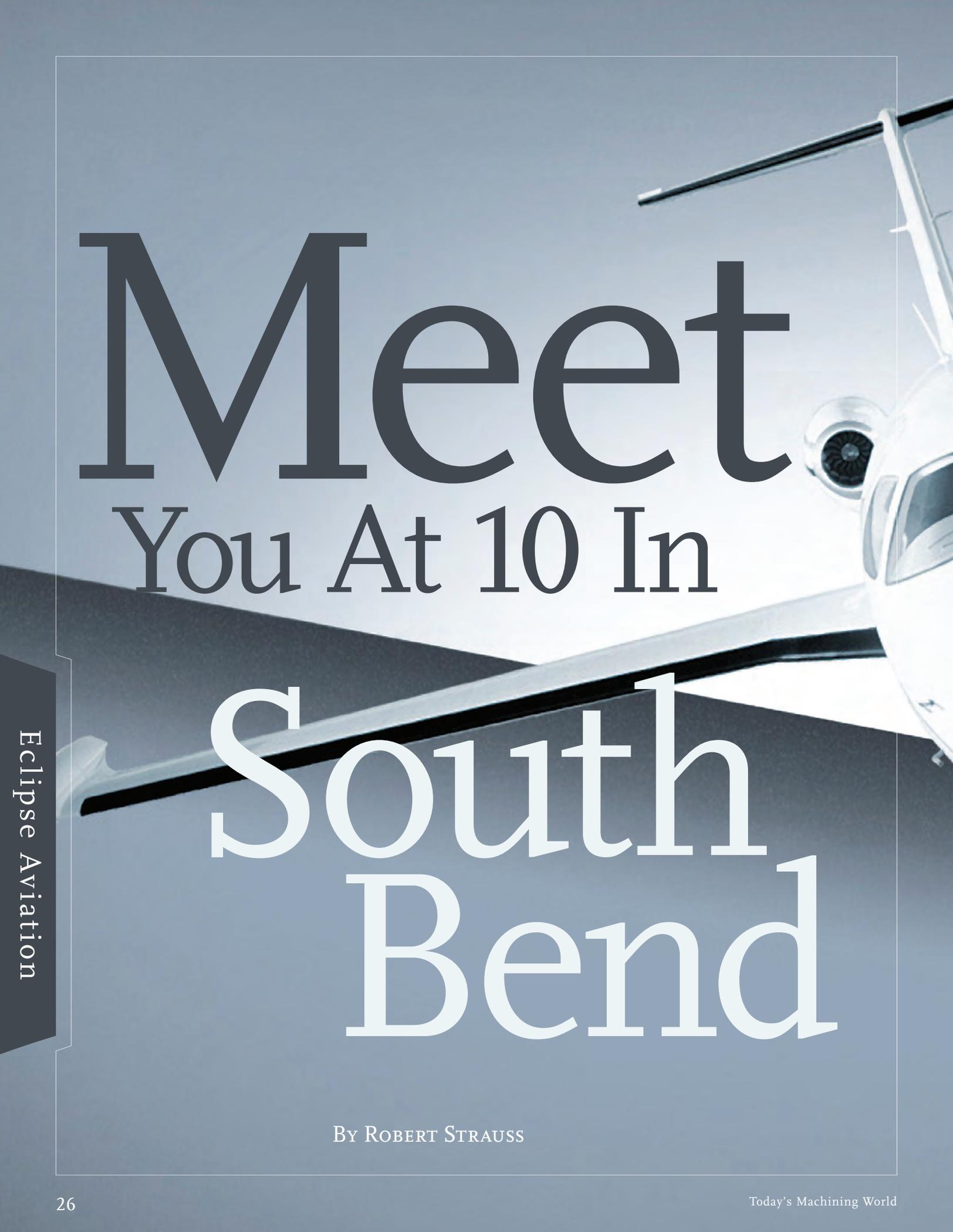
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BY ROBERT STRAUSS



# The Air Taxi Age Approaches

When Bill Herp heard about the Eclipse 500 VLJ, he thought back to his Harvard Business School days and one of his favorite professors, Clay Christensen, who wrote the best-selling 1997 business book, *The Innovator's Dilemma*. In the book, Christensen talks about how even many successful firms do not see the next big thing coming down the road because they are wary of what he calls "disruptive technology."

The Eclipse 500 VLJ - the acronym stands for "very light jet," a jet with a maximum take-off weight of 10,000 pounds - may well be the vanguard of a new moment in aviation. Herp had started a small airline, Linear Air, in May, 2004, offering mostly executive travel and luxury charters, based out of Hanscomb Field in Bedford, Mass., outside of Boston, and Teterboro Airport in the New Jersey suburbs of Manhattan. Herp started with eight-seater Cessna Caravans, a comfy fit for his customers.

Then he heard about the Eclipse and fell like a teenage girl swooning over the pirate version of Johnny Depp. For a mere \$1.5 million, about a third of his per plane investment, he could have a fuel-efficient jet, which, albeit seating only four, rather than eight, would enable him to have a more nimble fleet and cut his expenses considerably, without sacrificing safety, speed or service - sometimes enhancing all three.

"Between airline deregulation and the hassles of flight in major airports and the technology of the engines and the innovative manufacturing, the whole thing has become that disruptive technology for Eclipse, and thus for us," said Herp, whose company is based in Lexington, Massachusetts, which has its own revolutionary history. Herp had already been involved in a start-up of another "disruptive technology" business, e-Dialog, which was in the forefront of using email as a marketing tool. Now he sees VLJs as a similar tool in his new business. "NASA and the FAA have been working for years to bring small turbine engines to the marketplace. Now, almost suddenly, they are here."

Whether the Eclipse 500 goes down with the Wright Brothers' bi-plane, the Spirit of St. Louis and the Apollo space capsule as a landmark in aviation may well depend on enthusiasts like Herp. The average air traveler may look at it and say, "It looks cool, but it still only gets me from here to there in about the same time as many other planes."

What the enthusiasts like Herp see, though, is something not so far off of the air travel craze spawned by Charles Lindbergh's cross-Atlantic flight on the Spirit of St. Louis. Vern Raburn, an early Microsoft employee, found himself flying rather inefficiently and expensively all around the country to board meetings, often to places that weren't served well by major airlines. He had been a flying buff since being a kid but had not quite figured out how to ameliorate his business flying problems.

Then he heard about the NASA initiative to get light-weight jets in service and, in 1998, founded Eclipse. He accumulated tens of millions of dollars in seed funding, a lot from former Microsoft allies and, after eight years of tinkering and testing, is ready to put the Eclipse 500 on the line. Surely, Eclipse's publicity machine has been working wonders. Though the first Eclipse in-house ride was in 2002, it had to go through rigorous testing by the FAA, with certification for commercial use only coming through this fall. Yet even before the first official sale, the Eclipse 500 found itself featured in such places as the *Wall Street Journal* and the *New York Times*.

The key to whether the Eclipse 500, or whatever VLJs follow it, are ultimately successes may have less to do with whether they are actually better at flying than their heavier and larger competitors and predecessors, but whether they can sell quickly enough.

Eclipse Aviation has set a price point of about \$1.5 million for the 500 - cheaper for some early advance orders - but that assumes the company can sell about 500-700 planes a year at a break-even point.

"I think the market might accommodate 1,000 planes a year, especially if the price stays at \$1.5 million, which is really cheap," said Mark Bobbi, of MB Strategy Consult-

ing, a Prospect, Connecticut airline business research firm. "That \$1.5 million is not a lot of money if you have already spent \$3-4 million on a turboprop. The problem is that 1,000 planes in one piece of the business jet market is a huge number, since we are selling only about 600 to 650 now."

Eclipse claims to have 2,500 advance orders for the 500, which spokesman Andrew Broom says will get made over the next three years - 40 to 60 by the end of 2006, another 500 or 600 in 2007, and the rest early the following year as production is expected to ramp up to four a day.

That is the real secret, according to experts, using an old Henry Ford concept of the assembly line with the 21st Century blitz into outsourcing. Though Eclipse has either trademarked or claimed proprietary rights to some of its parts and processes, unlike Boeing or Cessna or other aircraft manufacturers, the great bulk of its parts are manufactured elsewhere and come to the Eclipse plant in New Mexico as, more or less, clip-ons. Pratt-Whitney makes the engines; Fuji Heavy Industries makes the wings; seats, doors, noses are all made by individual suppliers.

"High volume is new to the aircraft industry. Most aircraft are almost made to order, even at Boeing," said Bill Bonder, the vice president for supply chain management, a vital position at Eclipse. "To us, in order to maintain costs, the airplane has to be built for quick manufacturing. We have tight tolerances. Some things just snap together."

"It is almost like the difference between Lego blocks and cutting and sawing," said Bonder. "Holes are pre-drilled. Interiors are pre-formed and snap in. It is something no one has seen before in aircraft manufacturing."

One of the keys to the volume that Eclipse Aviation needs to make it successful (spokesman Broom says 750 planes per year will be what the company is aiming for) is for the air taxi concept to take hold. Linear Air's Herp has ordered 30 and DayJet Corporation, a Del Ray Beach, Florida company that intends to start an air taxi service based on Eclipse 500s, has ordered more than 200. That alone is about the same number of Cessna business jets sold each year, but at less than half the price.

"The entire business aviation community - in fact, the entire personal aviation community - is going to be looking at this product. It is a phenomenon," said Walter Desrosier, vice president of engineering and maintenance of the General Aviation Manufacturers Association.

The Eclipse 500 is admittedly small and light - only 33.7 feet long by 37.9 feet in wingspan by 11 feet in height. Empty, the plane is 3,550 pounds and can carry 249 gallons of fuel. Eclipse's Broom said its small size does not compromise its safety. "The FAA certification would never allow that. No one can get away without making



safety a main part of an aircraft,” said Broom. And after initially negotiating with Williams for its engines but reaching an impasse, Eclipse is using a PW610F engine Broom said was developed specifically for the company by Pratt & Whitney Canada. It is a two-spool engine with 900 pounds of take-off thrust. Eclipse’s promotional material claims that the engine will go at least 3500 hours without an overhaul and reach stage four noise abatement, the better to have uninterrupted cell phone conversations aloft.

Broom said that the initial push for the Eclipse 500 is definitely the potential of an air taxi industry, with Linear Air and DayJet its two premier customers.

“We could not do this until the entry cost of an airplane like the Eclipse came about,” said Mark Reed, the vice president of maintenance operations at DayJet. “They have simplified a lot of systems and taken out lots of weight. They have lost the complexity of system design, and that keeps the price point down, as well as service costs.”

Reed said DayJet is counting on ferrying people around who might otherwise decide to drive relatively

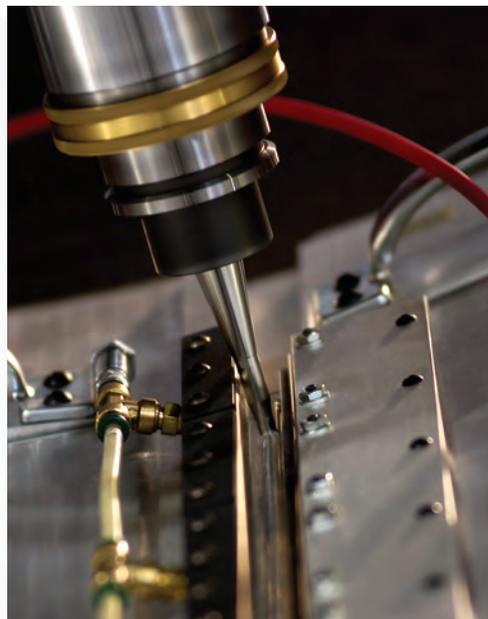
long distances. He said they are not competing with people who, for instance, live near Miami and are going to Atlanta.

“Our typical trip will be from Boca Raton to Tallahassee,” he said. “Now, maybe a person will drive that and take two days, or go down to Miami, which is a drive in itself, to catch a flight to Tallahassee.”

Before the smaller and cheaper VLJ, it might be too expensive to have small jets at the ready for such flights, but now, if, say, DayJet can use an Eclipse to do a quick Boca-Tallahassee run for three executives at \$2500, instead of them either driving interminably or doing a hassled commercial run for \$1800, it becomes a viable business.

Still, there are skeptics in all quarters. Consultant Bobbi, for instance, is not sure there is all that great a market for air taxis.

“The size of that market is really questionable, so I am not a great fan of the concept,” said Bobbi. “Still, I am a fan of anything that can keep costs down in aviation, and that is where Eclipse and the future VLJ competitors may affect general aviation.”



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Bobbi said he was particularly impressed by Eclipse's use of friction-stir welding in getting its component parts together. In friction-stir welding, which was only developed in the 1990s, a rotating tool heats up and plasticizes the materials to be welded, basically eliminating the interface. It is primarily used with aluminum and magnesium alloys and can be used in long joints, so it is good for large objects such as aircraft.

The lean manufacturing aside, Bobbi said, Eclipse is going to have to find general markets for its planes and not depend on air taxis, whether or not that will be a viable business.

"That price point is quite attractive, since a businessman may have already paid \$3 or \$4 million for a turbo-prop a couple of years ago and now could trade that for an Eclipse and get some cash back," he said.

On the other hand, said Scott Livingston, president of Horst Engineering, a supplier of precision components and assemblies for the aircraft industry, Eclipse may be benefiting from both good public relations and a general upswing in the aircraft industry.

"Right now, we are in the middle of a boomlet," said Livingston. "The market is strong for military aircraft, jumbo jets, regional aircraft, parts; and now, apparently, new markets like VLJs. I can't complain, because anything new can only help the industry at large."

Livingston said that Eclipse began life in 1998, in the midst of another aircraft boom and, apparently, was slowed down when the industry went into a trough after the 9/11 disaster. Whether it captures the money, and not just the attention, of potential small jet buyers is still a question.

"This is not a huge subset of people, and they may be the type of people who say, 'If I am going to spend \$1 million for an Eclipse, maybe I can spend \$2 million and get more,'" said Livingston. Then there are other VLJ manufacturers, or potential manufacturers, down the road. Adam Aircraft Industries hopes to be in production of its A700 VLJ next year, albeit at an initial price of \$2.3 million. Down the road, projected for 2008, is a VLJ from the Brazilian group Embraer. Around the corner, lurking and looking, are the big boys from Honda, which could be in production by 2009 if the company decides a market is there.

For the time being, though, Eclipse stands alone, and if disruptive technology is indeed the key to a new major aircraft segment, the Eclipse 500 may well one day be up there with the space capsules and Spirit of St. Louis, hanging from the ceiling of the National Air and Space Museum, the 21st Century's first air icon.



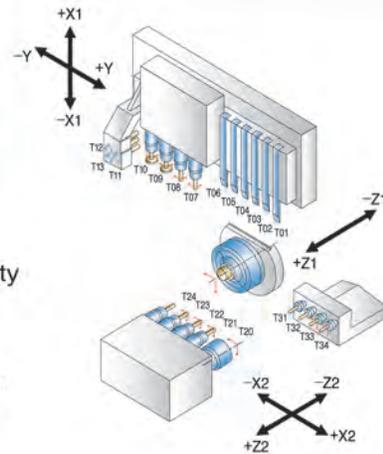
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# Made in Mexico

Lloyd Graff Interviews Jack Schwietert of V-S Industries

**LG:** We're with Jack Schwietert of V-S Industries to talk about manufacturing in Mexico. Jack, when was the decision made to establish an operation in Mexico?

**JS:** The decision was made in 1993. At that time, we were supplying a customer who had multiple plants in the states. They gave us an award for being their best supplier. One of the fellows I was dealing with asked me, "Have you ever considered putting a shaft manufacturing facility in the Southwest? When I said no, he said, "Our largest client is a motor manufacturer in Juarez, Mexico. We actually supply the shafts to this plant ourselves. We did a study recently and discovered we're our own shaft suppliers. We've been working to resolve that but to no avail."

The plants that they had here were very inflexible union plants, and probably did not like the idea of supplying to Mexico. He said they found a lot of good metal turn

companies in the Southwest, but they seemed oriented around defense industries making 15 perfect parts a week. When you asked for 30,000 parts a week, they just couldn't conceive how you would even do that. They wanted to see if we were interested in starting a facility down there.

Now when I worked for 3M, I would visit an engineer friend of mine who took me to their Maquila facilities in the Tijuana area. I met people he dealt with and always kept a file on Maquilas. We decided we would go down there. I didn't know how to conduct business in Mexico. We decided we needed a Maquila operator who would shelter us and take care of the payroll. Our customer actually became our shelter operator, and we operated for the first year and a half of our existence down there in the plant of our customer, with him supplying our workers. We told him how many people we needed, he took care of

the payroll and at the end of the month, they would give us a bill for how many hours we had used. After a year and a half we hired Carlos Castel, the fellow who ran our operation in their facilities. I hired him away from our customer with their approval. We had written into our contract that we could go out and deal with other customers, but I never felt that was appropriate as long as we were under their roof. Their business increased, and they needed the space. We wanted to do work with other customers. We moved into our own Juarez facility in January 1996. We now have four other customers down there. It's very low volume, quick turnaround, high value-added business, exactly what you want in Mexico. The only thing that's really cheaper in Mexico is labor. The building in Juarez is every bit as expensive to lease or own as it is in El Paso. The power is probably more expensive. The work rules are probably more restrictive in Mexico. Juarez is part of the State of Chihuahua, which is a very conservative state. That's where the PAN party started. We are non-union, but that's a little unusual in Mexico. Most places in Mexico are union companies but are considered "white," meaning friendly unions.

**LG:** It seems a little bit counterintuitive when you say, "High value-added, quick turnaround goes to Mexico," where you might think that there are less skills; and therefore, the high value added part might be difficult to pull off.

**JS:** That's probably very true. One of the problems when you talk about Mexico is that you have a high turnover problem, which has been exaggerated. You hear horrendous numbers of 2% and 3%, 4% per month and think, "how would I ever run my business? I would be training all the time." We do train all the time. We do need skilled people, and we need skilled people to stay with us. But I would also say that Mexico is not unlike the United States. That turnover is primarily with lower skilled people. Your key people stay with you here and in Mexico as well. We still have four or five of the first twelve people we ever hired in Mexico.

**LG:** How many people do you have?

**JS:** We have 180 people. We've been as high as 240 people. Our business is somewhat seasonal. In Mexico, there are problems hiring and firing. If you hire someone and decide you're going to let this person go because business has dropped, you're on the hook for three months worth of wages for that person. That's the law.

**LG:** If your Juarez operation was in El Paso, do you think it would be successful?

**JS:** Yes, it would be successful, but I think we're more profitable because we're in Mexico, and labor is such a large part of the expense in this business.

**LG:** Tell me what wages are in Juarez vis-à-vis El Paso or McAllen.

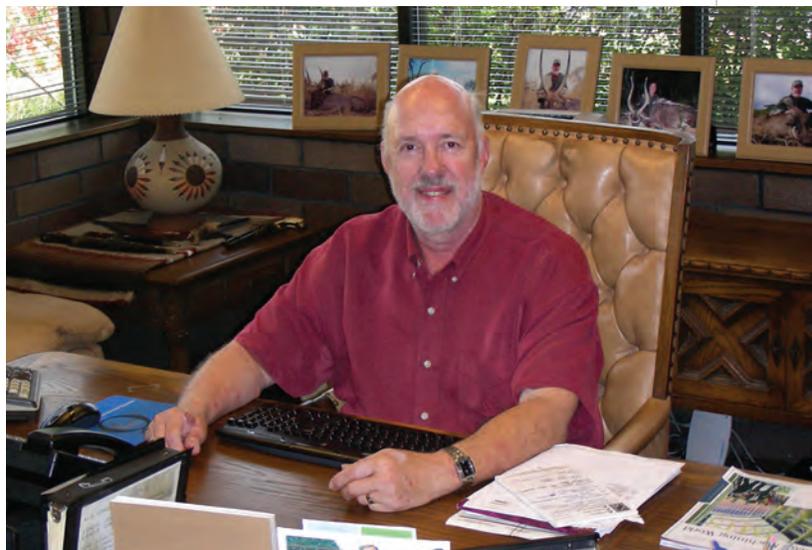
**JS:** For a good machine operator, in Juarez you're looking at \$2.50 to \$3.50 per hour gross plus benefits, and in El Paso you're looking at \$10 to \$12 per hour. When you're in Mexico, your benefit package is probably 80% to 90% of your wage vs. 35%, maybe 40% in the States.

**LG:** So what you're really saying is \$3 equals \$5 with benefits. In El Paso \$10 would mean \$13. So you're really talking about \$5 versus \$13 for machine operators. You're value-added is coming primarily on labor.

**JS:** Exactly. It's coming from labor because you're doing set-ups all the time and pushing this product through. We are on a 5-day cycle time with one customer we're servicing there. If we get an order on Friday, we have to deliver that product next Thursday, and we have no idea what he's going to order. Every morning, we get a list of 35 to 40 different items, and we have to deliver that. Typically it's a motor shaft with multiple steps on it. It usually requires features like a key way, a broach flat, always ground, sometimes heat-treated. If it requires heat treatment they do give us extra time to do it because there's very little support in heat treating or plating. The heat treater we use is in Las Cruces, New Mexico. We cross the border, get heat treated, then come back across the border. It's not difficult, but it's a day both ways. That time is written into our contracts. We deal only in dollars. We won't take a job with pesos. I don't want to be in international monetary speculation.

**LG:** Does your product go to plants in Mexico?

**JS:** Yes. The idea for us going to Mexico never was to go down and do something because it was less expensive and then import it and sell to a customer up here. Right now, there's a number of people in the industry who are doing that in China, actually importing product from





China because there's an economic advantage. We never found that to be the case with Mexico. We moved down there because our customers were looking for short cycle time.

**LG:** So then the rationale is 1) proximity and 2) cost. Proximity concomitant with faster turnaround time.

**JS:** Exactly. We're an export company, really. 70% to 75% of our sales for the last 10 years actually exit the country, even out of Wheeling, IL. We supply Brazil, Portugal, China and Korea. But Mexico, certainly far and away is our biggest ship-to point, partly because we have developed relationships with companies in Mexico, but also because customers we had here eventually moved to Mexico and asked us to come to Mexico to support them.

**LG:** That's interesting. So you see the big opportunity has been in developing customers in Mexico who find it difficult to find suppliers in Mexico.

**JS:** Exactly correct. And that's why we started McAllen, Texas. We ship about \$14 million worth of product out of Wheeling every year to the areas of Monterrey, Saltillo, Reynosa, which are all within 2 hours of McAllen. Our decision to go on the McAllen side of the border instead of the Reynosa side was because it's an automated product. The proportion of labor we've got when you look at the total cost is not that great, and there was no real advantage to being in Mexico.

**LG:** Tell me about what it's like going back and forth between El Paso and Juarez.

**JS:** It's become more and more difficult because of the problems we're having now. In Juarez, Carlos has a pass that allows him to cross the border without stopping. But he has to be alone in the car to do it; he can't be carrying passengers. So typically when I go down, he will drop me on the Mexican side and I'll walk over the bridge. I will pass customs on foot, and he will pick me up. If they search your car it can be up to 40 minutes crossing the border.

**LG:** Can you fly to El Paso direct, or is it through Houston?

**JS:** American has 2 flights a day non-stop to El Paso from O'Hare. One of the flights is 7:30 at night, so I can spend the entire day here, hop on the airplane, and I'm there at 9:30 at night. I get up in the morning and have a full day down there.

**LG:** Tell me about the financial arrangements of owning a company in Mexico. Can an American company own a Mexican firm like yours?

**JS:** Yes. We're a subchapter S corporation; when we first started the facility in Juarez, there was a rule that subchapter S corporations couldn't own more than 79% of the foreign entity. We would have had to change our facility to a C Corp, which I didn't want to do. I made our manager a partner, so he has part ownership in that facility. That's no

longer the rule today. The arrangement in Mexico is a typical Maquila arrangement. From a tax standpoint, when we do our distributions, this is what we have:

We have an office in El Paso. That office is called V-S Precision USA. We have a plant in Juarez. That plant is called V-S Precision SRL. SRL is a legal form similar to a partnership in Mexico. V-S Precision USA has the relationship with our customers. Our customers order from V-S Precision USA, which is a two-person office in El Paso. All the orders and payments are in dollars, made to V-S Precision USA. Virtually all of our steel comes from the United States, so we order from V-S Precision USA. The only thing that V-S Precision SRL does for us is add value to the product. So we have a transfer price agreement between V-S Precision USA and V-S Precision SRL to supply product at a certain price. We say, "Our transfer price is going to be the cost that we spend in Mexico, V-S Precision SRL, every month plus 6%." At the end of the month V-S Precision SRL adds up all of the expenses they had for that month. They add 6% to the bottom and they send the bill to V-S Precision USA. That way you show a 6% profit in Mexico on expenses in Mexico. The Mexican IRS, which is called Hacienda, looks at transfer prices very closely, and if you show that you're making at least 6% there, they typically will leave you alone on your transfer price agreement. You're showing 6% of the profit on SRL expenses in Mexico, so you pay Mexican tax on that. But all of the Mexican tax that you pay is 100%; the IRS views it as foreign tax credit to the tune of 100%. So you're not paying any more tax by being in Mexico. It makes filing more difficult, but it's not costing you Mexican tax on top of U.S. tax. Whatever you pay in Mexico the IRS gives you credit for in the United States. And the Mexican government has tried to keep business taxes very close to what the U.S. tax is, around 35%.

**LG:** Have you found the Mexican authorities easy or difficult to deal with?

**JS:** Probably a better question for Carlos. From afar, what I see is that the laws in Mexico are very close to what the U.S. requires. Frequently you'll hear people say, "Well, someone went to Mexico because they don't have any laws relative to the environment." That's absolutely not true. We have a very sophisticated system for managing our cutting oils down there. We actually have a separate little facility adjacent to us that handles all our swarf. I haven't seen an OSHA fellow, because they can only cover so many facilities. They spend their time looking at the worse cases. There's so many people working for the government of Mexico they can afford to be at a company every week. It's not a situation where you have to pay people off. There's plenty of corruption, certainly, but we don't deal in payoffs. But with the environmental laws down there you can



bet someone is going to visit you on a very regular basis. There's probably a lot more time spent on the enforcement aspect just because they have the people to do it.

**LG:** What's been the most rewarding part of doing business in Mexico?

**JS:** One of the most satisfying things is being able to do something for the community down there. When we first started our facility, we built parking spaces for 50 cars, and there weren't a dozen cars in it. Obviously our employment grew, but at this point there are probably a hundred people who drive to our facility. You kind of stop and look at that and say, "We are an employer who offers a better wage than the average person putting a wire harness together. We demand more of our employees, but we also pay a better wage." We are part of the developing middle class in Mexico.

**LG:** Is there a real competition for workers down there?

**JS:** You asked me about the effect of China. The effect of China actually was most significant back in 1999, 2000, 2001. At that time, Juarez had an unemployment rate of about 5%, which was unheard of because you could never get enough employees in Juarez. That has pretty much turned around now, in part because some people moved back, but I think more and more U.S. companies and foreign companies have moved to Mexico. The turnover situation becomes more aggravated the tighter the labor market is, and the labor market is tight right now. What you see in Mexico are employees or companies competing for employees on the basis of benefits, not wages. We serve our employees 2 meals a day; we include that in the employment agreement. There will be companies

that have 3 meals, that have shower facilities, that have bus service taking people to and from work. Nevertheless, you always have your core group of important people who get there every day.

**LG:** Do you have top-notch setup people who would be competitive in Chicago?

**JS:** We do. When we started the facility down there we took five or six people from our facility here in Wheeling, who were primarily Hispanic, and moved them down there for a period of time. Two people decided to stay down there. One is a very good grinding person and another is in charge of the cam equipment. We actually run far more CNC turning down there than up here because it's all short runs down there. Carlos has something like 45 CNC bar turning machines, mostly Star, some Citizen equipment. The fellow who runs that is from Mexico, who started with us in the first year of our production there and stayed with us. We do have people down there who are key to our operation and would be considered good people up here in Chicago as well. But I would also say that it's easier in Chicago to find that kind of technical expertise as it is if you were in Nashville or Memphis. You're compar-

ing a marketplace up here that is technically a very good marketplace compared to any place in the U.S. If we had to replace everybody down there with someone, it would be much easier to do it here in Chicago than down there.

**LG:** If you had a customer that came to you and said, "I want you to do what you did for me in Mexico, and I want you to do it in Shanghai" would you consider it?

**JS:** Yes, we have considered it because they have asked. But you're going to have to operate your Chinese company with someone from China, and I don't know anybody in China whom I trust. I think business in China and Mexico are similar in that regard. You have to develop a personal relationship with your key people in Mexico, not just a business relationship. If I knew someone in China like that, I would consider it. It's also 8,000 miles away as opposed to 1,200 miles away.

We're thinking about starting another facility in central Mexico, around Mexico City. We do have relationships down there where I know I can get very good management for that company. That's key. There's as many people who go to Mexico, have been disappointed and come back as there are people who stay. It probably has very little to do with where they were location-wise, but who was operating it and what kind of support they got.

I talk to some of the guys in PMPA about Mexico, and they look at me frankly and say, "Why in the hell would you do that?" It makes no sense to them whatsoever. And that's fine. It's not for the weak at heart. We're in the business of gambling all the time in our business; that's what we do. You mentioned to me the satisfaction of doing the magazine and doing something on your own, and I feel that with Mexico a little bit. That's something I did.

**LG:** So now I follow your train of thought. Long run work, capital intensive U.S. Niche work, labor intensive Mexico. Anything else you would like to say to our readers?

**JS:** Everyone has to make the determination whether it makes sense for their company or not. Mexico started for us because we had one customer who really wanted us down there. I said, "I'm not going to start a facility just for you. I need three good customers down here, and I'm not going to make a move until I pretty well lock that up," which we did. I would caution anyone about moving for one customer. You hear a lot of horror stories about that. And I think that's one of the problems with someone making a decision to do that. The key is to have the right people down there running it, but that would be no different than if we decided to start something in Denver.

Thanks, Jack.





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A continuing column in which we ask smart people to discuss their views on topics related to the future of manufacturing

BY NOAH GRAFF

Since 1993, the reported population of unauthorized immigrants in the U.S. has doubled in size to 11-12 million people. Addressing concerns of national security, job scarcity and xenophobia, the U.S. government has recently bolstered its commitment to securing its border with Mexico.

## In 5 years, will there be a fence between Mexico and the United States that effectively halts illegal immigration?

As long as wages in the United States are significantly higher than those in developing nations, and illegal aliens can readily obtain employment in the United States, no fence or other enforcement strategy that primarily focuses on the border will deter millions of people from violating our immigration laws annually. Impoverished, desperate people will find a way to go over, under, around or through any types of physical barriers that are built. Without enormous concurrent increases in the size of the Border Patrol and detention capacity, as well as the political will to incarcerate everyone who is caught crossing the border illegally, this strategy is doomed to fail. A far more effective and sensible solution to the illegal immigration crisis would be to implement a system that enables employers to easily determine who is authorized to work here, and, at the same time, swiftly impose harsh and sure penalties against those employers who ignore or disobey the law.

T.J. Bonner, President  
National Border Patrol Council, Campo, CA

## the facts:

December 15, 2005, **The House of Representatives passed bill 4437, calling for mandatory fencing along 698 miles of the Mexican border.**

The border between the U.S. and Mexico spans 1,951 miles. **The urban areas of San Diego, California and El Paso, Texas (which contain barriers) have been the location of the greatest number of illegal crossings.**

[www.wikipedia.org](http://www.wikipedia.org)

Since 1993, **the U.S. Government has spent more than \$20 billion to reduce the flow of unauthorized immigration from Mexico, and it continues to commit more than \$6 billion annually to that cause.**

Last year, **only 3,200 employment-based visas were issued to Mexicans, in a year when more than 400,000 Mexicans were added to the U.S. work force through illegal immigration.**

There will be a wall between the United States and Mexico in 5 years—the lone question remaining in 2006 regarding it is: how long will it be? As seen most recently in Israel, fortified borders can and do serve vital security interests. However, such a wall on the border with Mexico is only one of several needed remedies for addressing our current illegal immigration crisis in the U.S. The magnet for illegal immigration into the U.S. is the widespread availability of jobs; so, [fencing/barriers] must be joined by a consistent and robust interior enforcement regime at the workplace. There must be mandatory employee verification and significant sanctions for employers who fail to comply with the law.

**John Keeley, Director of Communications**  
Center for Immigration Studies, Washington, D.C.

No. Putting up fences has only pushed clandestine border crossing to other parts of the border. This will continue since the cost of fencing the entire U.S.-Mexico border is prohibitive—somewhere between \$3 and \$10 billion dollars—more than the entire education budgets of Arizona and New Mexico. As it is, 20-40% of undocumented migrants in the United States entered the country legally and overstay visas. The best long term solution is to work with Mexico to raise Mexicans' standard of living. This is why we no longer have large-scale Irish or Italian migration to the United States.

**Irene Bloemraad, Assistant Professor, Sociology**  
University of California, Berkeley, Berkeley, CA

Illegal immigrants [in the U.S.] are the most fully employed, with **94% of the men in the work force** – significantly higher than native-born Americans.

Wayne A. Cornelius  
Director, Center for Comparative Immigration Studies  
University of California-San Diego  
Testimony prepared for the House Judiciary Committee  
Field Hearing on Immigration  
San Diego, Calif., August 2, 2006

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one on one

**James Epolito** is President and CEO of the Michigan Economic Development Corporation (MEDC), a 265-person operation leading Michigan's economic development efforts. Prior to joining the MEDC, he served as President and CEO of the Accident Fund Insurance Company of America and was Senior Vice-President of Subsidiary Operations for Blue Cross Blue Shield of Michigan.

**What does your job entail?**

Michigan Economic Development Corporation is about retaining jobs, attracting jobs and getting companies to consolidate their operations in Michigan.

**What does Michigan's economy have already that can help it thrive in the future?**

I think number one is our able bodied and ready workforce, both skilled and unskilled. I think the brainpower we have because of our university system and the diversification of the economy is unbelievable.

**What types of diversification?**

The diversification into life sciences and health sciences, and advanced automotive and advanced manufacturing. Also, alternative energy and alternative fuels, wind energy, solar – and there's great opportunities in the homeland security and defense area.

**What does Google coming to Ann Arbor mean to Michigan?**

People see Google as the coolest company in America to work for. Everybody kind of has a smile about it, and it really has had a tremendous psychological impact in a very positive way on our population and how people in Michigan look at themselves.

**Aren't the high-tech jobs just a drop in the bucket in comparison to how many people have lost their jobs in automotive?**

If the metric that you define success for anything in Michigan or the MEDC is how many jobs you've lost in last few years and how many jobs you've gained as a state, we're not going to fare very well. But at the same time, that's part of the transformation that is occurring and that we have to live through and absorb. I think we've lived through it the last six years and we're coming out on the other end of it now.

**Do you see Ann Arbor as the "new Detroit?"**

No. I see Ann Arbor as the new Palo Alto—the new really high-tech center. More young people are moving into Ann Arbor. Then you go to Grand Rapids Michigan, which is becoming the center of health sciences in Michigan and in the Midwest.

**Does anybody want to come back to Detroit?**

You know, it's an amazing thing. Yesterday in the *Detroit Free Press*, they had this half page article of these people sitting out in a little bistro in downtown Detroit. All the loft apartments are growing like crazy in downtown Detroit. The twenty-somethings, thirty-somethings—that's where they want to live. People are rediscovering the city, and I think people are rediscovering cities all across the nation.

**What's one thing you love about the state of Michigan?**

I love the people. I think the people of Michigan have been through a lot. And I love their resiliency and their ability to bounce back.

**What's one thing you really dislike about Michigan?**

I really dislike the negative perception of Michigan by people that don't live here. All that those people have read about is the loss of automotive jobs and Michael Moore's films.

**What are you most optimistic about for the future of Michigan's economy?**

I'm most excited about this transformation. I believe Michigan is at a tipping point where it is morphing from this auto based rust belt economy into the high-tech mega-center.

**What's the worst case scenario?**

The worst case scenario is just that it doesn't happen fast enough. Because there are a lot of people suffering that were somehow left behind in this transformation.

**If you could be any machine what would you be?**

I'd be a money machine that can bring capital to our state.

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# how it works

BY BARBARA DONOHUE

## From Ore to Insert:

**D**on Graham, turning products manager at Seco Tools, Inc. (formerly Seco-Carboly), told the story of how tungsten ore is processed into tungsten carbide, which then becomes a state of the art cutting tool insert. Additional information provided by the web sites of the following organizations: the *American Chemical Society's Chemical & Engineering News*, *American Machinist* magazine, International Tungsten Industry Association, Kennametal and Seco-Carboly.

Tungsten carbide, often called simply “carbide,” is a familiar material around the shop. This compound of tungsten and carbon has revolutionized the metal-cutting world over the decades, enabling increased speeds and feeds and providing longer tool life.

Tungsten carbide was first investigated as a cutting tool material in 1925, by Dr. Samuel Hoyt, a scientist at General Electric's Lamp Department. Later GE opened the Carboly division to produce tungsten carbide cutting tools. In the late 1930s, Philip M. McKenna, founder of Kennametal, discovered that adding a titanium compound to the mix made the tools work better at higher speeds. This began the march toward today's lightning-fast cutting speeds.

“Cemented tungsten carbide,” the material that makes up the tools and inserts, is actually grains of tungsten carbide, along with particles of other materials, cemented together using the metal cobalt as a binder.

# Making Tungsten Carbide Cutting Tools

An extra close pitched CoroMill 245 with coated inserts for steel milling, from Sandvik Coromant.

Photo courtesy of Sandvik Coromant

Cutting Tools

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Right: Xtra-tec face  
milling cutter for  
cast iron, from  
WALTER USA, Inc.

### It starts in the ground

There are several tungsten ores that can be mined and refined into tungsten or made into tungsten carbide. Wolframite is the best known. The ore is crushed, heated and treated with chemicals. The result: tungsten oxide.

Then, the fine particles of tungsten oxide are carburized, turning them into tungsten carbide. In one method, the tungsten oxide is mixed with graphite (carbon). This mixture is heated to over 1200° C (2200° F) and a chemical reaction occurs that removes the oxygen from the oxide and combines the carbon with the tungsten to yield tungsten carbide.

### Grain size is key

The size of the carbide grains determines the mechanical properties of the final product. The size of the grains will depend on the size of the tungsten oxide particles, and how long and at what temperature the oxide/carbon mixture is processed.

The tungsten carbide particles are a fraction of the size of a grain of sand. They are likely to range in size from half a micron, to as large as 10 microns. A series of sieves sorts out the different grain sizes: less than one micron, one and one half microns, and so forth.

At this point, the tungsten carbide is ready for blending into "grade powder." In the tungsten carbide industry, one speaks of grades rather than alloys, but they mean the same thing.

The tungsten carbide goes into a mixing vessel with the other components of the grade. Powdered cobalt metal will act as the "glue" to hold the material together. Other materials, such as titanium carbide, tantalum carbide and niobium carbide are added to improve the properties of the material when cutting. Without these additives, when cutting ferrous materials, the tungsten carbide tool may experience a chemical reaction between the tool and the chips of the work piece that leaves craters in the tool, especially at high cutting speeds.

# how it works

## Mix it up

All these ingredients are blended with a liquid such as alcohol or hexane and placed in a mixing vessel, often a rotating drum called a ball mill. In addition to the grade ingredients, cemented balls 1/4" to 5/8" in diameter are added, to help the process of adhering the cobalt to the carbide grains. A ball mill may be as small as five inches in diameter by five inches long, or as large as a 55-gallon drum.

When the mixing is complete, the liquid must be removed. This typically happens in a spray dryer, which looks like a stainless steel silo. An inert drying gas, nitrogen or argon, is blown from the bottom up. When all the liquid is removed, the remaining dry material is "grade powder," which looks like sand.

For cutter inserts, the grade powder goes into insert-shaped molds specially designed to allow for the shrinkage that will happen later on in the process. The powder is compressed into the molds, in a process similar to how pharmaceutical tablets are formed.

## Taking the heat

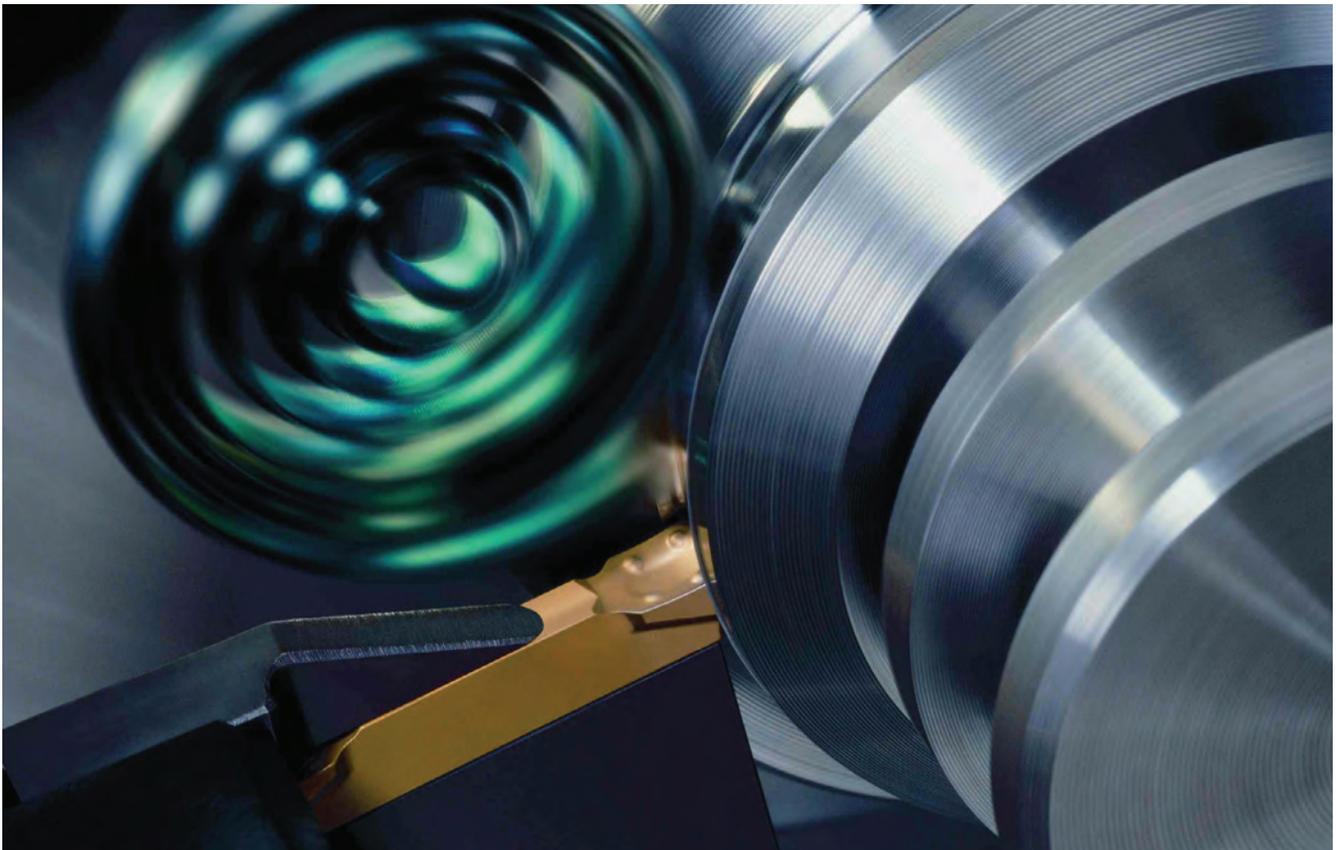
After pressing, the form looks like oversized inserts and is fairly delicate. They are removed from the molds and placed on graphite or molybdenum trays, and go into a sintering furnace where they are heated in a low-pressure hydrogen atmosphere to 1100-1300° C (about 2000-2400° F). The cobalt melts, and the insert consolidates into a solid, smaller size.

After the inserts are removed from the furnace and cooled, they are dense and hard. After a quality control check, the inserts are usually ground or honed to achieve the correct dimensions and cutting edge. Honing to a radius of 0.001" is typical, though some parts receive a cutting-edge radius of half a thousandth or as large as 0.002", and some are left "dead sharp," as sintered.

Some types and designs of inserts come out of the sintering furnace in their final shape and in-spec, with the correct edge, and don't need grinding or other operations.

The process for manufacturing blanks for solid carbide tools is very similar. The grade powder is pressed to shape and then sintered. The blank or stock may be ground to size afterward before shipping to the customer, who will form it by grinding or perhaps EDM.

Inserts bound for most non-ferrous applications may be ready to package and ship at this point. Those destined for cutting ferrous metals, high temperature alloys or titanium, will need to be coated.



Above: Novex Cut grooving system at work, From WALTER USA, Inc.

# Introducing Tungsten

Tungsten, in its elemental form, is a silver colored metal. Its atomic number is 74 and its average atomic mass is 183.85. One of the densest metals, it is more than twice as dense as steel. And it has the highest melting temperature of any metal: 3422° C (over 6000° F).

We call it “tungsten,” which means “heavy stone” in Swedish. So why is its chemical symbol “W”? That comes from its other name, wolfram. Legend has it that back in the 1600s, miners noticed that a particular ore (which turned out to contain tungsten) interfered with smelting tin; it seemed to eat up the tin as a wolf devours its prey.

Two common ores of tungsten, wolframite and scheelite, were discovered in Sweden in the 1700s, and in 1783 the metal was isolated by two Spaniards, who named it wolfram.

According to the International Tungsten Industry Association, the majority of tungsten reserves are in China, and currently about 80 percent of tungsten is mined there. In the last couple of years, the price of tungsten ore has risen sharply. Perhaps as a result, recycling of tungsten, including tungsten carbide, is on the rise.

## Sources:

American Machinist: [www.americanmachinist.com/304/GlobalSearch/Article/False/8081/](http://www.americanmachinist.com/304/GlobalSearch/Article/False/8081/)  
[www.americanmachinist.com/304/GlobalSearch/Article/False/9148/](http://www.americanmachinist.com/304/GlobalSearch/Article/False/9148/)  
Don Graham, turning products manager, Seco Tools, Inc., Warren, MI  
International Tungsten Industry Association, London, UK, [www.itia.org.uk](http://www.itia.org.uk)  
Chemical and Engineering News, American Chemical Society, Washington, DC;  
Take an entertaining and informative look at the elements in the periodic table.  
[www.pubs.acs.org/cen/80th/elements.html](http://www.pubs.acs.org/cen/80th/elements.html)  
Handbook of Chemistry and Physics, Chemical Rubber Publishing Company  
[www.Kennametal.com](http://www.Kennametal.com)

## Coatings finish the job

To prolong tool life under challenging cutting conditions, many types and combinations of coatings have been developed. They can be applied in two ways: by chemical vapor deposition (CVD) or physical vapor deposition (PVD). Both types are applied in furnaces.

## Chemical vapor deposition

For CVD, the coating is usually 5- 20 microns thick. Milling and drilling inserts usually receive 5–8 microns, as these operations require better surface finish, and they encounter more impact, so they require greater edge toughness. For turning applications, the coatings tend to be in the range of 8–20 microns. In turning, heat and abrasion tend to be more of a concern.

Most, but not all, CVD coatings are made up of multiple layers, usually three distinct layers.

Each company has its own “recipe” for coatings. Here is a typical scheme, building up three layers.

- one layer of titanium carbo-nitride for hardness and abrasion resistance
- one layer of aluminum oxide, which retains hardness at higher temperatures and is chemically very stable
- one layer of titanium nitride, which prevents metal buildup from fragments of the workpiece welding to the tool. This coating is gold-colored and makes it easy to observe wear of the edge.

To apply a CVD coating, the parts are placed on trays and sealed in a furnace. The furnace is drawn down to a vacuum.

**Right:** Crown-shaped MF5 chipbreaker insert optimized for the medium/finishing application area commonly associated with near net machining, from Seco Tools, Inc.



# how it works

For each layer, the appropriate gases are introduced into the furnace, such as hydrogen, titanium tetrachloride, methane, nitrogen, aluminum chloride. A chemical reaction occurs, depositing the layer of coating on the inserts.

The aluminum oxide provides thermal protection, keeping heat out of the body of the insert, important for high-speed applications. For low speed applications, an insert may not need an aluminum oxide layer.

## Physical vapor deposition

PVD coatings are typically about 2-4 microns thick. Different manufacturers use different numbers of layers. These PVD coatings are well-suited to applications cutting high-temperature, nickel-based, cobalt-based or titanium-based materials, and sometimes steel and stainless steel.

Titanium carbo-nitride, titanium nitride and titanium aluminum nitride are widely used as PVD coatings. The latter is the hardest and most chemically stable PVD coating.

The inserts are mounted on racks so they are separated from each other. Each rack rotates and the whole assembly of racks revolves within the furnace, so every surface of the inserts is exposed to the deposition process. The furnace is evacuated.

Strong negative charge is applied to the inserts. A piece of titanium, or titanium and aluminum is installed on the wall or floor of the furnace. The metal is vaporized by either an electric arc or an electron beam, liberating the positively charged metal ions. These ions are attracted to the negatively charged inserts. Nitrogen and methane are added as appropriate, to achieve the different types of coatings.

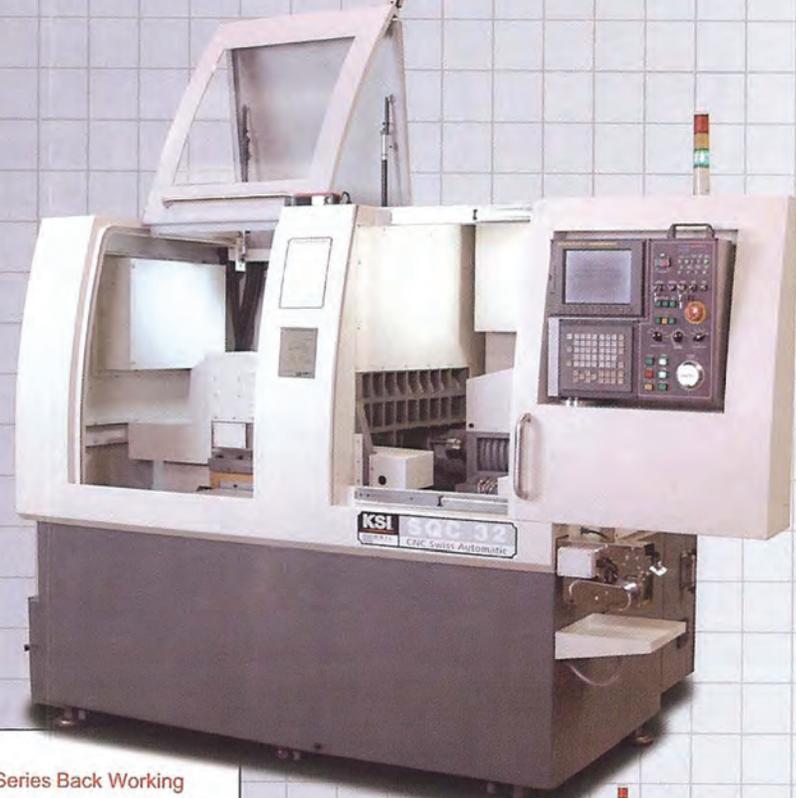
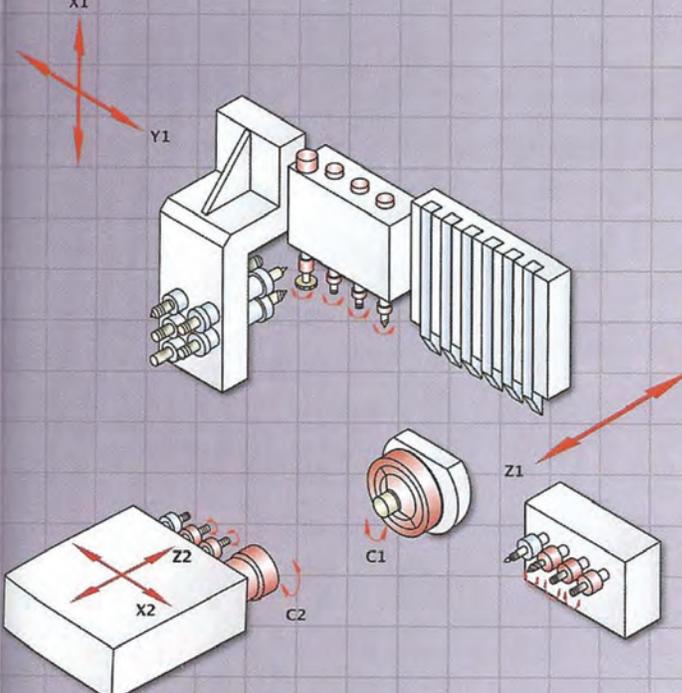
When the inserts are removed from the furnace they may be ground again, or directly packaged and shipped.

Tool manufacturers are meeting the pressures for ever-increasing feeds and speeds, and the need for longer tool life and lower costs, by continually improving the designs of tungsten carbide cutting tools and developing better and better coating technologies.



Below: QuattroMill™ 45° lead facemills from Seco Tools, Inc.

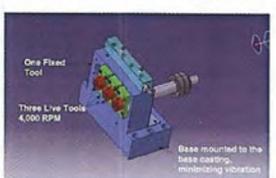
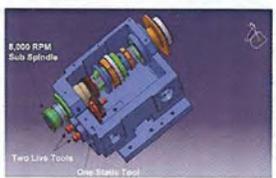
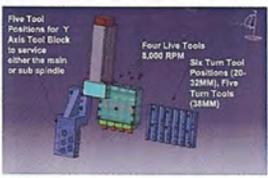




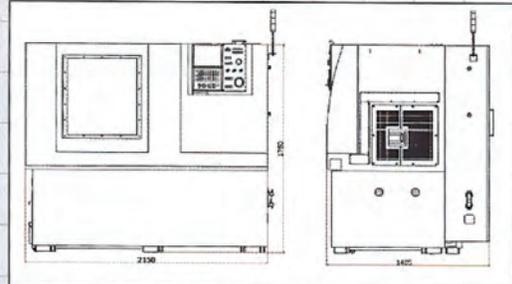
**SQC Series Main Spindle Tool Layout**

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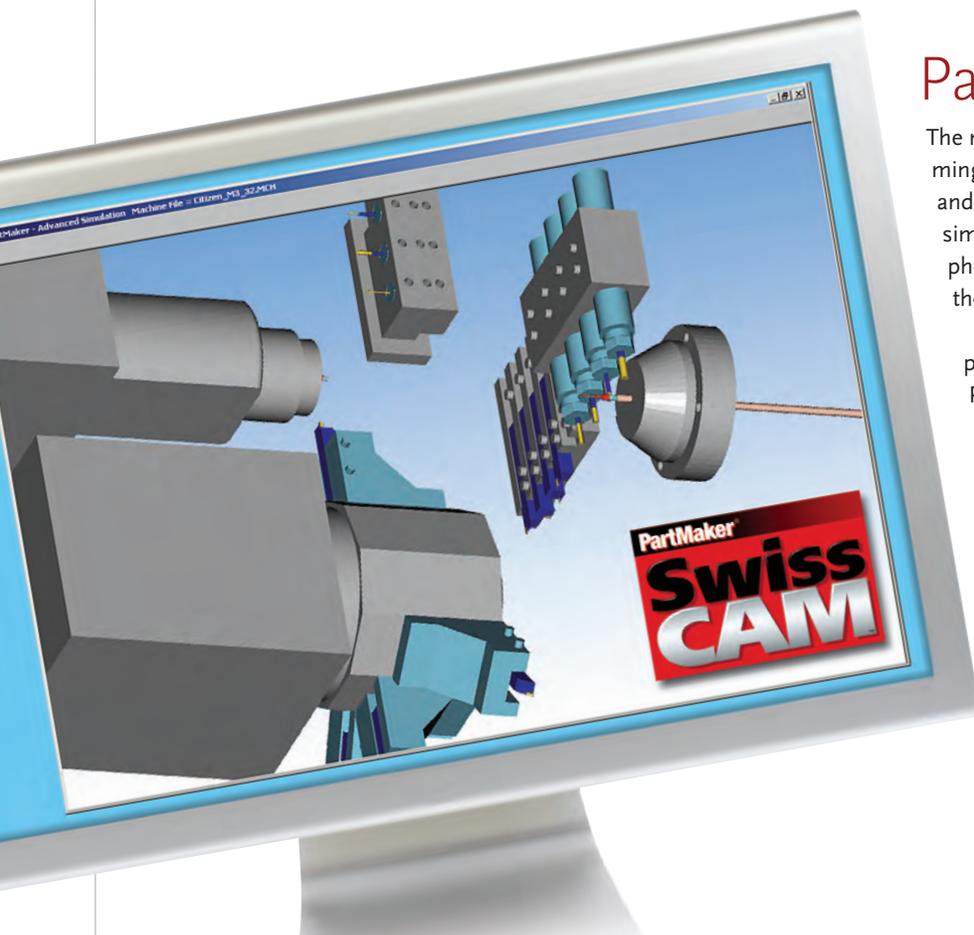


# product focus

THE FOLLOWING ARE COMPANIES  
WHO AIDED US IN CAD INFORMATION:

**E**ach month, *Today's Machining World* works to help you understand how the precision parts marketplace works, what's available in the industry, and how you can use available resources, as well as knowledge, to run a more efficient and effective shop. In every issue, we'll feature a product category and focus on equipment key to remaining competitive in our marketplace.

CAD, or computer-aided-design, has become an integral part of the machining process. Hanan Fishman, president of IMCS/Partmaker says, "As machine tools become more complicated, lot sizes shrink, tolerances become tighter, geometries become more complex and skilled labor becomes ever more scarce, the role of CAD/CAM software in the precision machining business has become more important. CAD/CAM software needs to be powerful enough to support the most complex applications, but easy enough to be implemented quickly and provide a rapid return on investment."



## Partmaker Inc.

The next version of PartMaker Software for programming CNC Mills, Lathes, WireEDM, Turn-Mill Centers and Swiss-type lathes will feature a new full machine simulation module which allows the user to view a photo realistic 3D model of the machine for which they are programming a part.

This new simulation module will provide improved error checking and collision detection to PartMaker users by allowing them to perform an even more robust machining simulation than currently offered in PartMaker. The machine model being simulated incorporates machine specific tool holders and attachments to assure that any possible collisions that could occur on the machine will be detected off-line on the user's PC. The ability to detect such problems off-line is beneficial for CNC programmers and machinists because it means they will have to spend less time in setting up new jobs and performing dry runs to assure there are no collisions on the machine.

For more information, please contact PartMaker Inc. at 215-643-5077 or visit the company website at [www.partmaker.com](http://www.partmaker.com).

## Open Mind Technologies

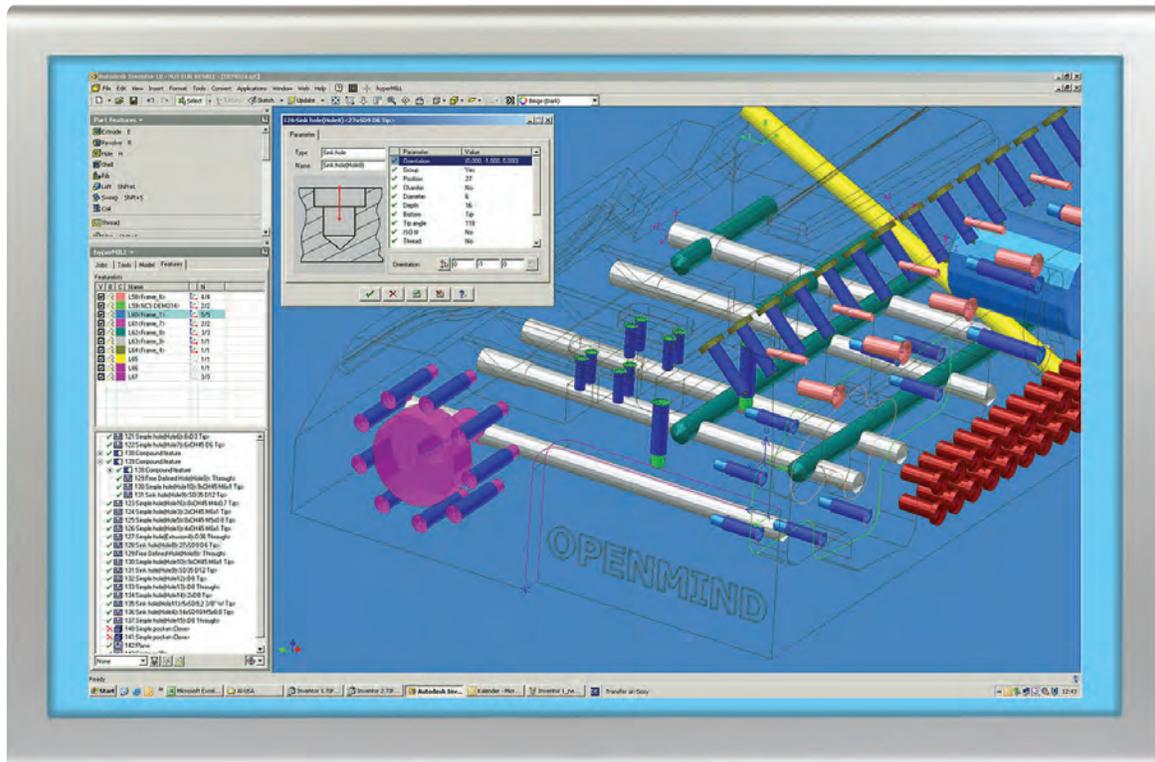
Autodesk has officially certified hyperMILL® CAM software from OPEN MIND Technologies for version 11 of Autodesk Inventor®. With this certification, Autodesk guarantees that third-party applications are perfectly compatible with Inventor. It is possible to design and perform calculations in parallel. Familiar user interfaces reduce error rates and increase acceptance amongst users.

hyperMILL® integrates fully developed feature technology, which considerably minimizes programming effort due to feature recognition and transfer, hole and pocket features as

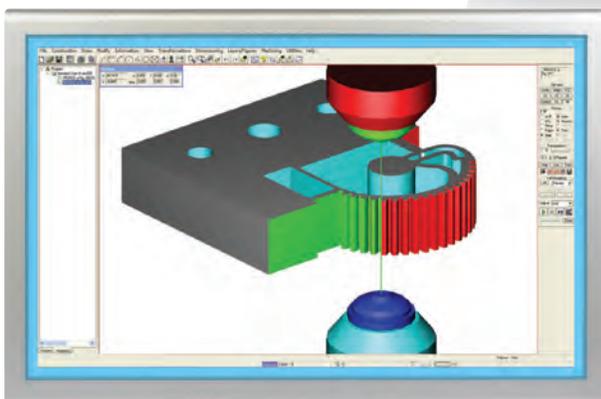
# product focus

well as a feature list and feature browser. Maximum flexibility is guaranteed through 2D, 3D, HSC and innovative 5-axis modules, all under an intuitive user interface.

For further information, contact OPEN MIND Technologies USA, Inc. at 781-239 8095, or visit the company website at [www.openmind-tech.com](http://www.openmind-tech.com).



## Camtek North America



PEPS CAMFlow Director includes automated feature-finding, knowledge-based feature machining, machine kinematics, toolpath simulation and CNC code generation.

Modular enhancements are now easier to 'plug in' to the base system. CAMFlow is centered on interactive and clear flowcharting tools that can be used in key areas of the new CAM system functionality. Best practice / preferred methodology can be configured and stored in the system. CAMFlow is also used to automatically find machineable features of model data and apply automated pre-configured machining to them. Features can also be defined within SolidCut itself. SolidCut Design – integrated component and fixture solid modeling - has also benefited from new user-interface options.

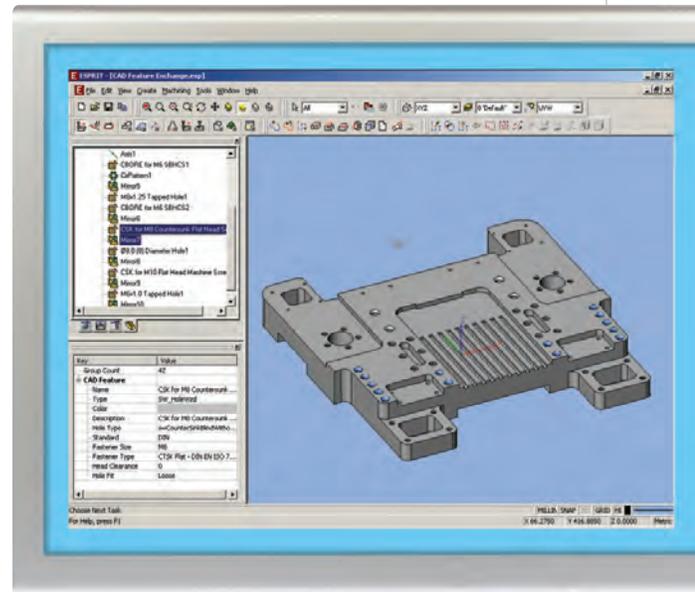
For more information, please contact Camtek North America, Inc. Phone: 678-625- or visit the company website at [www.peps.com/us](http://www.peps.com/us).

## SolidWorks

SolidWorks Corporation has unveiled SolidWorks® 2007 software. In addition to more than 200 new features, this latest version of the leading 3D CAD software introduces SolidWorks Intelligent Feature Technology (“SWIFT”), which allows SWIFT FeatureXpert to automatically create the new features in the proper order as the designer intended. Other SWIFT tools in SolidWorks 2007 include the SWIFT SketchXpert, which resolves dimensional and relational conflicts when sketching, and the SWIFT MateXpert, which removes conflicts that arise when users add or modify mated parts. The tool will also pinpoint new routing and weldment content in SolidWorks 2007.

SolidWorks 2007 includes enhancements to Sketch Blocks, introduced last year. 2D sketches of belts, chains, pulleys, and gears now automatically exhibit multipart interaction and motion. This feature combines the intelligence of 3D CAD with the feel of 2D CAD. The unique SolidWorks Design Checker includes new features to ensure drawings meet the defined standards of each user’s organization. The new features include auto-correction and the ability to “learn” from a finished drawing.

For more information please call 1-800-693-9000 (outside of North America, call 1-978-371-5000) or visit the company website at [www.solidworks.com/SW2007PR/](http://www.solidworks.com/SW2007PR/).

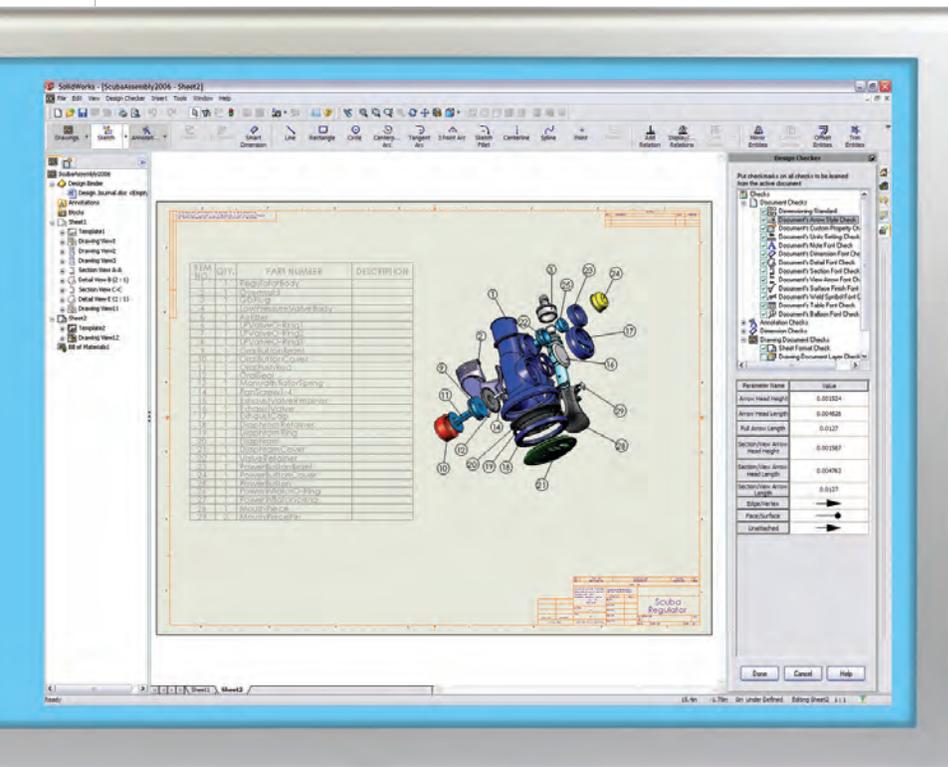


## Esprit

ESPRIT FX™ is the latest in CAD to CAM feature exchange technology. The FX™ technology provides portions of the original CAD Feature Tree directly inside the ESPRIT user interface thereby including the complete original design intent – features, tolerances, material properties, surface finishes, administrative data, etc. Using the FX™ technology the CAD features and their associated properties are mapped into machinable features providing a complete definition of ‘what’ is being machined.

Within ESPRIT 2007, the FX technology applied to milling allows users to now easily distinguish between the type of a given feature. Using the FX technology, one can automatically distinguish between hole types and determine such things as thread pitches and tolerances. Using the ESPRIT 2007 FX™ technology for EDM programming automates the process of determining how a part should be cut— 2-axis or 4-axis. FX technology allows ESPRIT 2007 to automatically map one or more CAD features into one or more machineable features.

For additional information about ESPRIT, call 1-805-388-6000 or visit the company web site at [www.dpstechnology.com](http://www.dpstechnology.com).



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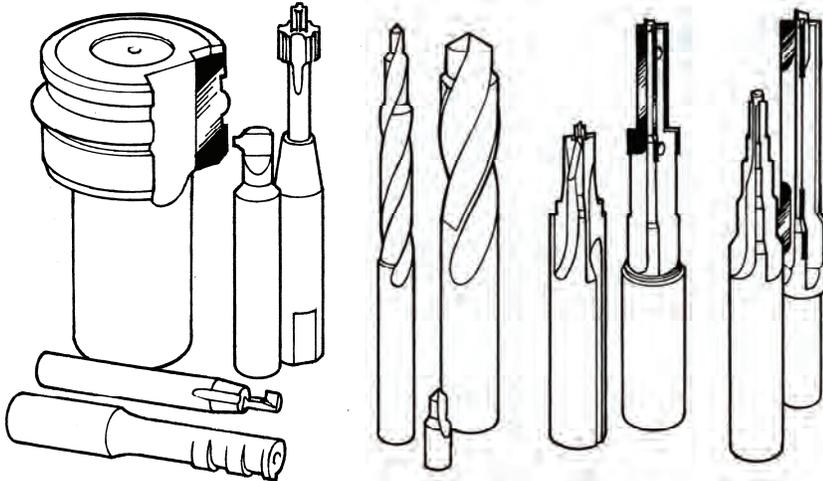
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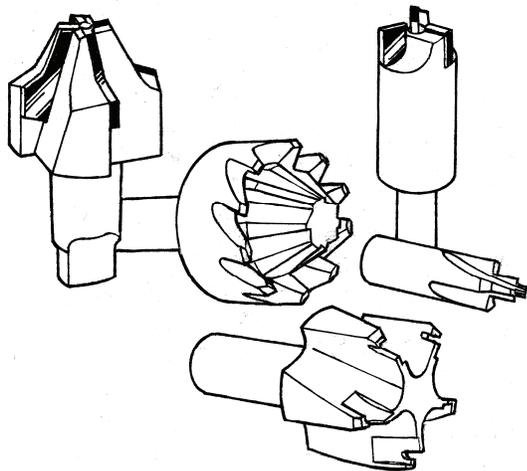
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# Accepting Amenities

I've got a great purchasing department. There are specialists in commodities, equipment, engineered products, and even someone who buys all our office and building supplies for our three locations. Recently, one of the department members was bragging about the new set of golf clubs she won at a vendor's golf outing, and it got me thinking about the potential for kickbacks or extravagant gifts and how that could create problems, both internally and with some of our customers. We probably should have had some sort of policy years ago, but I've never seen a problem, at least so far. What should I be thinking about?

First, I wouldn't limit my concern to the buying side. You can have bigger problems on the sales side, particularly if you run afoul of a customer's purchasing policies. If you're selling to the government, there are gift giving activities that can not only disqualify you from bidding for work but can land you in the "big house." If you're selling overseas, "gifts" to foreign officials can violate the Foreign Corrupt Practices Act and the laws of your host country. There are tax issues as well, such as the deductibility of gifts or the declaration of them as income. The IRS doesn't fool around.

In addition to looking at the legal issues such as taxes and bribery laws, you should examine your customers' policies. Many companies place a dollar limit on meals and restrict employees from accepting anything more than a key chain or coffee cup with the vendor's logo. A customer's employee who overlooks these policies can be fired and get you off the vendor list. In an age where almost every action has the potential to be exposed, the era of the buyer's trunk quietly getting loaded with booze and food at the holidays is waning.

Obviously, a simple solution beyond reproach is to ban gift giving and gift getting. This however leaves a grey area, such as who pays for lunch or whether to accept an offer to use the vendor's box seats for the playoffs. It also denies the reality that business acquaintances occasionally develop into real friendships, where gift giving and other favors are normal parts of friendship.

Once you are satisfied that you are not violating the laws or someone else's policy, consider whether the gift does

anything to further the business relationship in a concrete way. Attending a vendor-sponsored outing such as a baseball game or a round of golf (where there is time to build a relationship) probably won't raise any eyebrows, even if there is little business discussed. Flying a customer to your Florida production facility in February for a plant visit may help you close a deal, even if there is some beach time or a round of golf built in.

On the other hand, a new set of sticks for the buyer is going to look like a bribe or a kickback for that recently awarded purchase order. In the case of your buyer, she "won" those golf clubs at an outing, so presumably there was nothing linking her good fortune to a particular transaction.

Other than the legal concerns beyond the scope of this reply, there is no bright line test. Bright line rules however, such as a dollar amount cap consistent with tax laws (the turkey or ham at the holidays) and a rule on event attendance, which considers who goes and what events are appropriate, make it easier for your sales and purchasing teams to gracefully accept what is permitted and decline what is not. Such rules also provide consistency, which is your company's own ethical compass.



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5/8" 6-spindle, thdg., pickoff, 1971-88 (8)  
1" 6-spindle, 1960-1992 (9)  
1" 8-spindle, 1979  
1-3/8" 6-spindle, 1980, 1967  
1-3/4" 6-spindle, 1965, 1993 (7)  
1-3/4" 6-spindle, factory rebuild  
1-3/4" 6-spindle, thdg., 1969  
1-3/4" 8-spindle, 1970  
2-1/4" 6-spindle, 1973-79 (3)  
2-1/4" 6-spindle ACW 2004  
3-1/4" 6-spindle, 1982  
5-5/8" 6-spindle, 1979  
6-5/8" 6-spindle, 1979

## ACMES

1" RAN6, 1975  
1-1/4" RA6, 1975 (6)  
1-1/4" RB8, 1956-1979 (3)  
1-5/8" RBN8, 1968-thdg  
1-5/8" RB8, 1980, rebuilt 1996. pickup  
1-5/8" RBN8, 1975, rebuilt 2002  
2" RB6, 1979-1985  
2-5/8" RB6-1977

3-1/2" RB6, thdg  
2-5/8" RB8, 1975 (4), thdg  
6" RPA8, Gov't Storage

## GILDEMEISTER & SCHÜTTE

GM16 AC 1997 w/ lemca loader  
SF51 6sp. Schütte, 1981  
AF26 8sp. Schütte, 1981 (2)

## SWISS-CNC SLIDING HEADSTOCK

Citizen L20, Type VII, 1996-98 (2)  
Citizen L25, Type VII, 1998

## NEW BRITAIN

Model 52, 1-1/4" 6sp., 1979 (3)  
Model 62 2-1/4" 6sp., 1975

## INDEX

MS 25E, 1996  
MS 36E, 1993

## DAVENPORT

3/4" thdg., pickup, 1985 (6) Tamer  
3/4" chucker, 1985 (4) Tamer  
3/4" thdg., pickup, 1975

## CLEARANCE

30-60 Hydromat units \$5500 each  
Davenport chucking package \$2500  
Alps bar loader for CNC Swiss \$3950  
Magnetic chip cover for 2-1/4" Wickman,  
1-1/4" RA6 or 3/4" RA8 \$2950/each  
Davenport spindle stopping clutches \$35 each  
(only 75 left)  
Ring-type chucking package for 1-1.4"  
RA6 \$2500  
Winter thread roll attachment 125A \$1100  
Mectron laser measuring machine mfd. 2000

## HYDROMATS

HW25-12 1986 (3)  
HB45-12 1997  
HB45-16 1997 - CNC units  
HS-16 2000  
HB45-16 chucker, 1997

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# New!

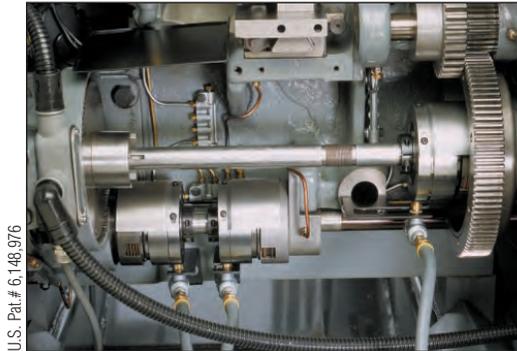
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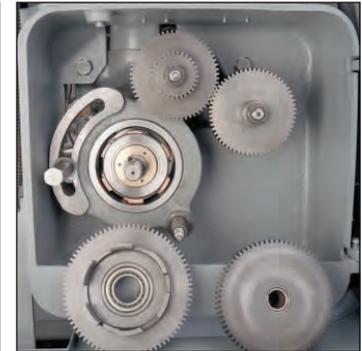
## Savings:

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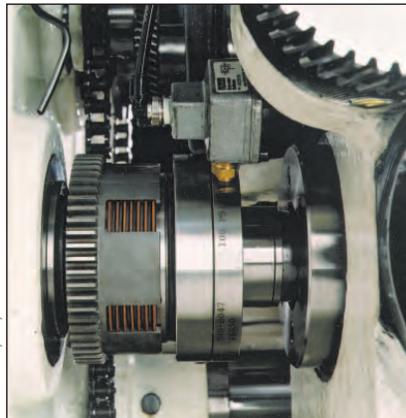


U.S. Pat.# 6,148,976

For Model B Davenports

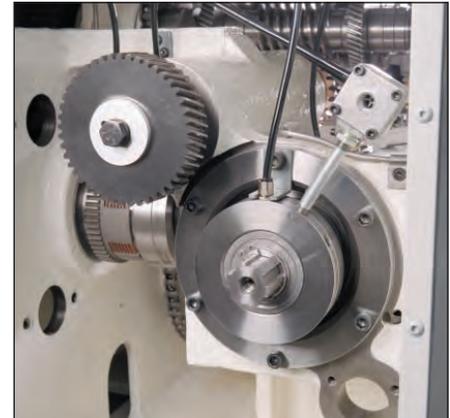


**New!** Roll Clutch Removal Option



U.S. Pat.# 6,050,162

For New Britains; High speed Conversion Kit - no slippage!



**New!** Roll Clutch Removal Feature

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## The Cessna Chronicles

I bought my 1949 Cessna 195 17 years ago from a gentleman at the Frankfort Airport in Frankfort IL. Every flight from this plane was logged until 1973. I found about 20 log books in the plane when I bought it. Everything I'm going to tell you came straight from the log books.

A lot of people owned this plane. It was sold in 1949 for one dollar and "other considerations" to an organization called the "Haitian American Development Association." For years it was flown every day in and around Haiti. It flew to Cuba and all the other islands and countries in that area. We don't know what it was doing, but every Thanksgiving it came back to the United States and stayed there until the end of the year. Every year, the Air Force put a new motor in the plane and overhauled everything. Then it returned to Haiti for another year.



I'm guessing that the Haitian American Development Association was actually part of the CIA because the airplane was used a lot during the period of "Baby Doc," the dictator in Haiti from 1971-1986. This old plane was involved in an invasion of Haiti around 1968. We don't know how it was involved, but we found 6 bullet holes in it. It received two hits from anti-aircraft rounds. For years, the airplane was flown all over the islands, and then it just disappeared in 1973 for 20 years.

Another interesting tidbit in the plane's history is that one of its pilots was named Jeb Magruder. There was an infamous Jeb Magruder who was involved in the Watergate scandal. I have an inkling it could be the same man. The plane was operated by the government dur-

ing Magruder's tenure in politics, and how many Jeb Magruders could there be in the world?

The plane finally turned up in 1993 when a gentleman from Okalahoma bought it. Interestingly, there are no records of whom he bought it from. Then the plane bounced around to maybe 5 owners in a 10-year period. It finally wound up being bought by a guy in Frankfort IL. It looked pretty nice at the time. Somebody had done a good job painting it and cleaning it up.

It sat at Frankfort for probably 5 years, and I always admired it because the 195 was the last airplane that Cessna made with a large radial engine in it—a big ol' 300 horsepower engine. After that, they all went to the flat-type engines. I admired that plane for 3 years, and then it disappeared again.

A couple years later, I was flying out to Kankakee Airport, and I saw the plane down at the end of the ramp. The doors were open, birds were in it. The upholstery was getting kind of shabby because the mice had gotten in there. After several attempts, I finally convinced the owner to sell it to me.

I cleaned it all up, overhauled everything, applied for a ferry permit and finally got it running.

It still needs a paint job, and there's no interior now, but mechanically it's in pretty good shape. One of these days when I retire, I'm going to finish restoring it. It's just too much fun to fly.





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Dear Shop Doc,

In our shop, we have a debate as to what type of tool is the most effective for centering a drill. Is it a spot drill or center drill? Since both of the choices are available in several different angles, what influence does the angle have on centering the drill or anything else, such as tool life? We have had mixed results from a variety of these tools. Please help us choose the tool that will give us the best centering and life of a drill.

Dear Off-Center,

This is a very common issue and is easily explained. A center drill doesn't do anything to center a drill. It's made to leave a centering feature in a part so a live center or dead center can be located into its corresponding angle and be used in some sort of supporting application like a tail stock in a lathe.

A spot drill has a better chance of centering your drill, but only if the included angle of the spot drill is greater (blunter) than the drill's included point angle. A great example of this is a 120° spot drill and a 118° drill point. The spot drill is 1° blunter on each side, allowing the drill's point to reach the spot drill's point before anything else comes into contact, such as the corners of the drill or the lip of the drill.

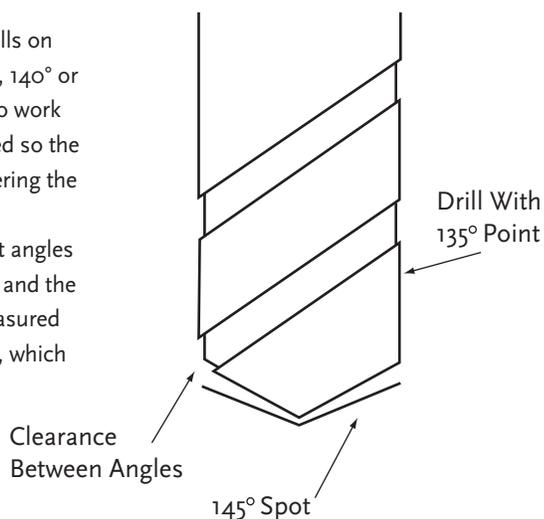
The problem with this is that many drills on the market today have drill points of 135°, 140° or even greater. So in order for this theory to work properly, a 145° spot drill needs to be used so the drill point makes contact first, thus centering the drill in the most effective manner.

A center drill actually has two incorrect angles to deal with. One angle is from the pilot, and the other angle is what the center drill is measured at or known by, such as a 90° center drill, which

## Signed, Off-Center

eventually leaves a 45° chamfer per side once the hole is drilled. Tool life suffers greatly when using a 90° center drill or a 90° spot drill with an incorrect angle. If you want a chamfered hole, chamfer it with a chamfer tool after the proper spot drill and drill are finished. By following these simple steps you will see drills lasting longer, and the holes will be more accurately located, straighter and rounder.

**Jim Rowe**  
Application Specialists / Medical Accounts  
Mahar Tool Supply, Warsaw, IN



Today's Machining World's "Shop Doc" column taps into our vast contact base of machining experts to help you find solutions to your problems. We invite our readers to contribute suggestions and comments on the Shop Doc's advice. If you consider yourself a Shop Doc or know a potential Shop Doc, please let us know. You should also check out the TMW online forum at [www.todaysmachiningworld.com](http://www.todaysmachiningworld.com).

**Have a technical issue you'd like addressed? Please email [noah@todaysmachiningworld.com](mailto:noah@todaysmachiningworld.com). We'll help solve your problem, then publish both the problem and solution in the next issue of the magazine.**



# Halloween Mask

You have five different colors of paint. How many different ways can you paint the Halloween mask if you make the eyes, nose and mouth each a different color?

Send in your answer—quick! Fax Jill at 708-535-0103, or email at [jill@todaysmachiningworld.com](mailto:jill@todaysmachiningworld.com)

31	13	67
73	37	1
7	61	43

## Magic Primes Square

Can a magic square be made up of only prime numbers and 1? (A magic square is an arrangement of the numbers from 1 to  $n^2$  ( $n$ -squared) in an  $n \times n$  matrix, with each number occurring exactly once, and such that the sum of the entries of any row, any column, or any main diagonal is the same)

### Problem solvers from August's Magic Primes Square Puzzle:

(leave it to **Miles Free** of PMPA in Brecksville, OH to give me 4 correct answers!); **Jeff Kovalenko** of Key Machine Tool in Elkhart, IN; **Kevin Fite** of Methods Machine Tools in Wixom, MI; **Steven Gredell** of Empire Machine Works in Raytown, MO; **Rick Hybben** of Hyco Machining in St. Paul, MN; **Lon Adamietz** of Bergmann Machine in Minneapolis, MN; **Greg Tetrick** of Cass Screw Machine Products in Minneapolis, MN; **Bill Nyborg** of Southwestern Machine Products in Odessa, MN; **Daniel Schlepp** of Wacker Corporation in Menomonee Falls, WI; **Steve Melo** of Caldwell Manufacturing in Lockhart, TX; **Mike Radu** of Claude's Accurate Machining in Vancouver, VA; **Tim Richmond** of Craden Manufacturing in Richfield, WI; **Steve Taylor** of Global Shop Solutions in The Woodlands, TX; **Deidre Lang** of Skimpy Oil Skimmers in Union Bridge, MD; **Roger Quakenbush** of D.S. Products in Wabash, IN; **Chris Morgan** of K & M Precision Products Co. in Dexter, MI; **Al McBride** of Threading 101, Inc. in Menomonee falls, WI; **John M. Weber** of Weber Systems, Inc. in Menomonee Falls, WI; **Alex Bruder** of EVM Inc. in Two Rivers, WI; **Jim Bennawit** of Tyco Electronics in Manheim, PA; **Elliot Boldt** of E & A Manufacturing in Dundee, MI; **Ron May** of Hunter Engineering Company; **Bill Priest** of HK Screw Machine Products in Oceanside, CA; **Jeff Fresen** of Mechanical Specialties in Olympia, WA; **Nathan Torberson** of Hydratight in Antigo, WI; **Candice** at Neal Chance Racing Converters in Cheney, KS; **Dennis Sauer** of Watts Regulator in Chesnee, SC; **Chad Brinkley** of Bartimaeus by Design in Thomasville, NC; **Jock Donaldson** of MyTana Manufacturing in St. Paul, MN; **Jim Spracher** of The Spracher Company in Bell Gardens, CA; **Uli Kuster** of Blaser Swisslube in Rochnert Park, CA; **Cathy Ogle** of Greenville, SC; **Karl Haromi** of Remke Industries in Wheeling IL and **Dan McCormick** of McCormick International in Erie Colorado.

# postings



Noteable and newsworthy information and events for the month of November.

Making Lean Work for the  
Job Shop &  
Small  
Manufacturer

Double Tree Guest Suites  
Anaheim Resort/  
Convention

November

8<sup>th</sup> & 9<sup>th</sup>

Anaheim, CA

[www.sme.org](http://www.sme.org)

Metalworking  
Fluids  
Management  
Certificate  
Program

Mazak  
National  
Technology  
Center

November 13-15

[www.sme.org](http://www.sme.org)

Florence, KY

Japan International  
Machine Tool Fair  
(JIMTOF)

Tokyo Big Sight  
Convention Center

Tokyo,  
Japan

November

1<sup>st</sup> thru the 8<sup>th</sup>

[www.jimtof.org/Eng/](http://www.jimtof.org/Eng/)

2006  
Election  
Day  
November 7<sup>th</sup>

AUCTION

Delta  
Faucet  
Company

Chickasha,  
OK

Wednesday  
November 1<sup>st</sup>

[www.hilcoind.com/auctions/](http://www.hilcoind.com/auctions/)

METAL  
WORKING  
CHINA

Shanghai  
New International  
Expo Centre

Shanghai, China

November

1<sup>st</sup> → 5<sup>th</sup>

[www.metalworkingchina.com](http://www.metalworkingchina.com)

[www.expoindustrialshows.com](http://www.expoindustrialshows.com)

The  
Industrial  
Operations  
& Machine  
Tool Show

St. Louis, MO

November  
8<sup>th</sup> & 9<sup>th</sup>



POP  
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Nov,  
19<sup>th</sup>  
1965

Abraham Lincoln  
delivered the  
Gettysburg  
Address

Nov, 19<sup>th</sup>  
1863

[www.butlerwebs.com](http://www.butlerwebs.com)

Mickey  
Mouse's  
Birthday

November 18<sup>th</sup>

[www.mickey-mouse.com](http://www.mickey-mouse.com)



Thanksgiving

November 23<sup>rd</sup>

[www.thanksgivingworld.com](http://www.thanksgivingworld.com)

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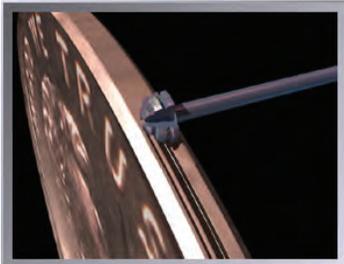
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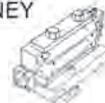
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## Radical Proposal

The Marine's advertising theme on TV extols the rigors of the Corps. The Corps meets its recruiting quotas partly because of a powerful media campaign. If the Marines can get a few good men to risk their lives in Baghdad, is it a stretch to believe that an aggressive, well-conceived media program could bring a new cadre of young people into the manufacturing trades?

I heard repeatedly during IMTS that the biggest single problem facing American machining today is the lack of skilled people who want to work in factories. So why not do something radical and change the conversation? If the Marines can get a few good men to volunteer to get shot at in Afghanistan, finding young men and women to make hip replacement parts in air-conditioned factories for 50 grand a year should be within grasp.

### This is my "radical proposal."

AMT, the Association of Manufacturing Technology, organizes IMTS. Next time around, add a surcharge of \$20 per square foot of exhibit space to the price of showing at the Big Show. Add \$20 to the price of admission. This should bring in nearly \$30 million. This will provide the marketing kitty to do what everybody says should be done – convince young people to consider the profession of making things with the help of machines.

There are a dozen reasons why kids are avoiding the manufacturing world. We all know the litany. But none are quite as persuasive, you would think, as the legitimate possibility of death or disfigurement in Anbar province.

But consistent, emotionally charged advertising, mostly on TV, seems to enable the military to meet its recruitment needs. With \$30 million from IMTS, a good ad agency could excite young people about the possibilities of building a career making useful things.

I'll offer a few possibilities for spots. How about a woman producing a part on a machining center on the day of a NASCAR race to rescue a broken car?

A hip replacement does not fit, so the nurse rushes it out of the operating room to the waiting machinist down the hall at the hospital.

I would suggest seed money for a reality show about life in a small contract machining shop making neat things. Or a cable channel devoted to manufacturing. Why not buy time for infomercials at times when the cost of advertising is so cheap and buy product placement for machining.

The key is to develop powerful messages for the proper demographic – probably young men and women, 14-29, English or Spanish-speaking, not programmed for investment banking or law.

A couple of the hottest fields for students today are criminal justice and forensic science. Ten years ago, who ever heard of forensics, but TV has made it a sexy profession.

Tastes are fickle and kids are malleable. Put Brad Pitt and Jennifer Lopez on a lathe or a mill and move the axis of perceptions. Ten years ago teaching was considered a dead-end job. Today, it's hot again.

The manufacturing world is fragmented. IMTS is the only thing which unifies a bunch of competitors. When a Haas, a Mazak or DMG spends millions on the show, what is \$60,000 a piece to insure a future for their products?

Here's my challenge to AMT and IMTS: Raise \$30 million from the show, preferably in advance. Hire a creative, youthful outside marketing team. Change the conversation about working and making things. Make it happen.

Lloyd Graff

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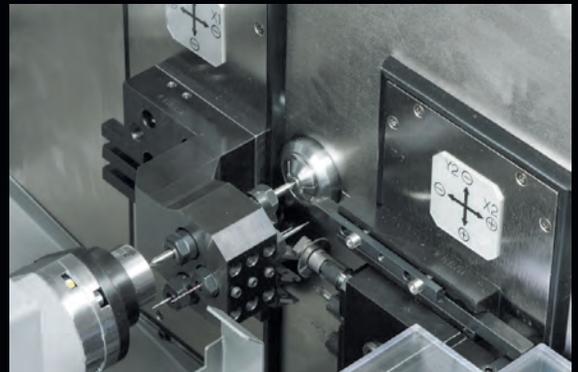
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