

## Lack of vision imperils U.S. aviation

BETTER COORDINATION IS NEEDED, SAYS REPORT



According to David Woods, the United States is quickly losing its dominance in aviation.

The United States' air transportation system is "in peril," as is the country's dominance in world aviation. These are conclusions of a report released in September by the National Research Council.

"In the past, we have been the world leader in aviation and aviation technology. But that leadership is eroding rapidly," says David Woods, who was a member of the report committee. Woods is a professor in the Institute for Ergonomics and co-director of the Cognitive Systems Engineering Lab at Ohio State University.

"Without a coordinated national vision, the U.S. aviation system and industry are in peril of falling into the shadow of other parts of the world," he said.

The report, titled "Securing the Future of U.S. Air Transportation: A System in Peril," looked at a broad range of problems in the aviation industry, including safety and security, the capacity of the air transportation system, and consumer satisfaction. >>>

### CULTURAL DIFFERENCES AFFECT AVIATION SAFETY

When discussing aviation safety, it is important to consider cultural differences in the way people think, notes Helen Altman Klein, Ph.D., a human factors psychology professor at Wright State University and an expert in the field of cognition.

"There is a wide disparity in commercial airplane accident rates in different parts of the world, and one of the factors of this may be cultural differences in cognition, or the way people think," she says.

Klein has served as a consultant to Boeing with the task of helping the airplane manufacturer address cultural differences between Western nations and other countries in the design and operation of their commercial aircraft.

"You don't provide equipment designed by and for Western minds to foreign nations and expect everything to operate in the same way. Design and education have to reflect national patterns of thought," Klein says.

<<< The report committee concluded that the government should institute focused national leadership for aviation, guided by a strategic vision that will enable the airline industry to meet increased travel demand in the future.

“While capacity may not seem to be a pressing issue today, as recently as the summer of 2001 extremely high demand for travel caused record delays at airports and dramatically lowered customer satisfaction,” notes Woods, who is also a professor of industrial and systems engineering at Ohio State.

The report illustrates the need for strategic coordination among the airlines, as well as among all the other stakeholders in air transportation.

Such strategic coordination will require new technology — specifically, computer networks that coordinate decisions among the stakeholders. And one of Woods’ areas of expertise — how people interact with computers to make decisions in high-risk environments — will be critical in carrying out the committee’s recommendations.

“Computer systems will have to be designed so that airline employees can monitor what is happening in the entire United States air travel system and accurately project the consequences of certain actions. As daunting a task as that sounds, such a system is necessary for the airlines to make appropriate decisions that affect safety and performance,” Woods says.

He offers an example: “Say weather in one area begins to delay a few flights. If I’m in charge of dispatching for an airline, I can make certain changes that will help my aircraft minimize delays and schedule disruptions. But what helps me could create bottlenecks for other aspects of the overall system.”

To make good decisions, he says, dispatchers must be able to see the big picture, such as what is happening at other airlines. The system must then be able to adapt to maintain capacity.

With nearly 25 years of experience diagnosing the factors behind human error, Woods has won awards for improving the safety of automated cockpits. He recently advised the Columbia Accident Investigation Board on its efforts to diagnose the contributors to the Shuttle disaster.

## Tackling terror with stats

GRAD STUDENT WILL USE STOCHASTIC PROCESSES TO PREVENT BIOTERRORISM



Serena Suewei Chan

A Cornell graduate student will research bioterrorism for the U.S. Department of Homeland Security.

Serena Suewei Chan, who is in Cornell’s statistical science program, was chosen from among 2,500 applicants to receive a research fellowship from the agency. She and her adviser, Gennady Samorodnitsky, professor of operations research and industrial engineering, will develop an epidemiological computer model of how terrorists could create an epidemic such as smallpox. To do this, they will use stochastic processes.

The fellowship will pay all of Chan’s tuition and fees for her doctoral studies at Cornell in addition to a \$2,300 stipend for 12 months. The fellowship is renewable for three years.

The fellowships, funded by up to \$2 million in fiscal 2003, support studying ways to prevent terrorist attacks in the United States, reduce the nation’s vulnerability to terrorism, and minimize the damage and recovery efforts from any attacks that occur.

## EVENTS

### > NOVEMBER

**NOV. 20-21**  
Safety and Health Law Symposium, Fort Lauderdale, Fla.; (847) 699-2929; [www.asse.org](http://www.asse.org)

### > DECEMBER

**DEC. 7-10**  
International Maintenance Conference, Clearwater, Fla.; (239) 985-0317; [www.imc-2003.com](http://www.imc-2003.com)

**DEC. 7-10**  
\*Winter Simulation Conference, New Orleans; (919) 515-6415; [www.wintersim.org](http://www.wintersim.org)

**DEC. 8-10**  
\*Supply Chain Information Systems seminar, Norcross, Ga.

### > JANUARY

**JAN. 13**  
\*Introduction to Supply Chain Improvement seminar, Norcross, Ga.

**JAN. 26-30**  
\*Six Sigma Black Belt (three-week seminar continues March 1-5 and April 19-23), Norcross, Ga.

### > FEBRUARY

**FEB. 20-21**  
\*Society for Health Systems Management Engineering Forum, Orlando, Fla.; <http://shs.iienet.org>

**FEB. 23-25**  
\*Supply Chain Facilities and Networks seminar, Norcross, Ga.

### > MARCH

**MAR. 8-11**  
\*Applied Ergonomics Conference, Orlando, Fla.; [www.appliedergo.org](http://www.appliedergo.org)

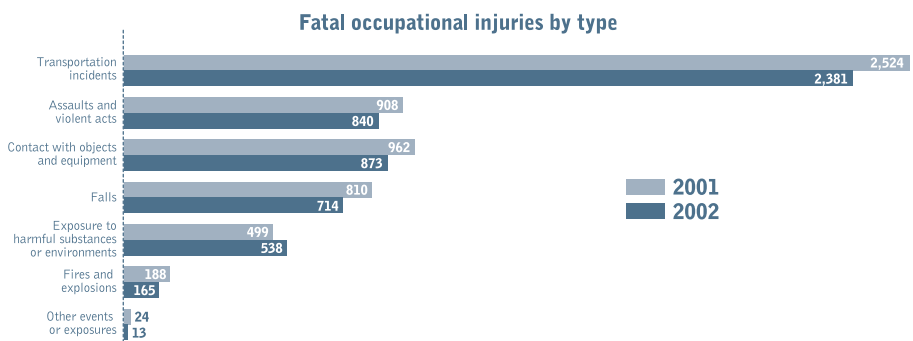
\* Conducted or co-sponsored by IIE. Call (800) 494-0460 or (770) 449-0461 or go to [www.iienet.org/events\\_for\\_information](http://www.iienet.org/events_for_information)

# Fatal work injuries decline

A total of 5,524 work injuries were recorded in the United States in 2002, a decline of 6.6 percent from 2001. The data comes from the Census of Fatal Occupational Injuries conducted annually by the U.S. Department of Labor's Bureau of Labor Statistics.

The count for 2002 was the lowest ever recorded by the fatality census, which has been conducted yearly since 1992. The fatality rate also reached a new low of four fatal work injuries per 100,000 workers.

Construction continued to record the highest number of fatal injuries of any major industry, although the total for construction was down 9 percent from 2001. Fatal work injuries in mining, manufacturing, transportation and public utilities, retail and wholesale trade, services, and government also declined from 2001.



Source: U.S. Bureau of Labor Statistics, "Census of Fatal Occupational Injuries, 1997-2002"

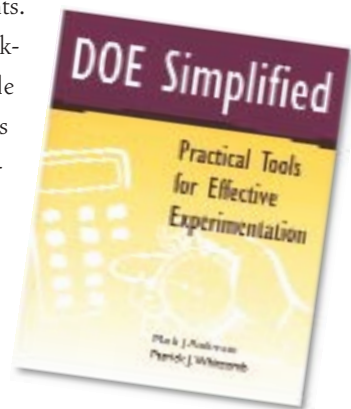
### BOOK OF THE MONTH

# Quality improvement tool

*DOE Simplified* is a comprehensive introduction to design of experiments. The book covers the bases for readers who have a limited statistical background. All the essentials are here: basic statistics for DOE, simple methods for collecting and displaying data, how to draw inferences from data, the purpose of confidence intervals, comparative experiments for testing hypotheses, blocking sources of variance from the analysis, two-level factorial designs, and analysis of variance.

Authors Mark J. Anderson and Patrick J. Whitcomb make use of anecdotes, quotes, and sidebars to deliver the material in a way that cuts through the complexities of this quality improvement tool.

*DOE Simplified* is published by Productivity Press (\$39.95).



<<< PRIME NUMBER >>>

## UNCOMPLICATED CAREER PATH

Finding a job is easy — if you're a robot. The number of iron-collar workers worldwide swelled from 35,000 in 1982 to about **950,000** in 2000, according to Purdue University industrial engineering professor Shimon Nof.

# Unhappy shift workers

## HORMONAL DIFFERENCES MAY TELEGRAPH SUSCEPTIBILITY TO HEALTH PROBLEMS

There is ample evidence that shift work, including night work, increases the danger of developing psychological and physiological health problems. The risk for cardiovascular heart disease, gastrointestinal disorders, and sleep disorders increases with the number of years people are employed in shift work.



Although the negative impact of shift work is well documented, there has been limited knowledge about the mechanisms behind disease susceptibility in workers. For example, why are some individuals affected more than others?

New research focuses on hormonal changes in satisfied and dissatisfied shift workers, and therein may be clues to why some people experience more adverse effects. The findings indicate

that dissatisfied shift workers experience problems with sleep and fatigue more than workers who are satisfied with their jobs.

A group of Swedish male shift workers participated in the study, which measured their morning hormone levels. Workers who had indicated they were not satisfied with their work hours had lower

testosterone levels in the morning, which may have been due to disturbed sleep or a high sleep need. A decrease in morning cortisol preceding workers' switch to a night shift may be related to an adaptation to long-term stress.

Low testosterone levels and disturbed sleep could be two factors for developing shift intolerance by reducing the capacity to recover from shift work, concludes the study.

# Say goodbye to lost manufacturing jobs

CURRENT ECONOMIC UPTICK WON'T MAKE UP FOR ALL LOSSES

Despite initiatives to address the job declines in U.S. manufacturing, the outlook for American factory jobs remains bleak, says a University of Michigan economist.

If output and productivity growth in the next five years matches the levels enjoyed during the economic boom of recent decades, manufacturing employment would amount to 15.4 million jobs — down 13 percent from the more than 17.6 million jobs in 1998 and up just 5 percent

from today's levels, according to Donald Grimes. Grimes is an economist at the UM Institute of Labor and Industrial Relations.

## MANUFACTURING LOSSES

Worst industries for job decline since 1998:

- Apparel (down 56 percent)
- Leather (down 50 percent)
- Textiles (down 40 percent)
- Primary metals (down 26 percent)
- Computers and electronics (down 25 percent)
- Machinery (down 23 percent)
- Electrical equipment (down 22 percent)
- Printing activities (down 17 percent)
- Paper and paper products (down 16 percent)
- Fabricated metal products (down 16 percent)

19.5 million jobs. Since then, the United States has lost about 5 million factory jobs, 3 million of which disappeared since 1998.

"This is an optimistic scenario," Grimes admits. "I think we will be doing well if the manufacturing sector has as many jobs five years from now as it does today."

Manufacturing jobs now number a little more than 14.5 million, down nearly 10 percent since the beginning of the recession in March 2001.

Grimes says employment in manufacturing has been in overall decline since 1979, when it reached its all-time high of about



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# Eliminating criminals with a shift-delete

## BETTER COMMUNITY COVERAGE AT A COST SAVINGS

In Buffalo, N.Y., police protection has improved dramatically with the introduction of single-officer patrols and work shifts designed to match the true pattern of daily calls to police.

The changes, which started July 16 with Buffalo's Central District, mean many more patrol cars on the street and fewer officers tied up on dispatched calls, according to Buffalo Human Resources Commissioner Leonard Matarese. Response times have been reduced significantly, in some cases by as much as half.

Wayne State industrial engineering professor Kenneth Chelst, one of a handful of experts in operations research applied to police and fire departments, designed the highly efficient work schedule after analyzing Buffalo's police dispatch activities.

The city of Buffalo asked Chelst to study its police patrol system with the idea of changing from two-officer patrol cars to one. This upstate New York city with a population of 290,000 was one of a dwindling number of major U.S. cities still using two-officer patrols.

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## REAL PRECRIME?

Last year's futuristic blockbuster *Minority Report* saw Tom Cruise acting in the role of a "precrime" cop with the authority to arrest citizens before they were able to actually commit their crime. A powerful new crime forecasting tool being field tested in Rochester, N.Y., may be the closest thing to a real precrime technique.

A Carnegie Mellon University team analyzed six million crimes recorded over a decade to quantify criminal trends. A computer model they built as a result of the analysis was successful in forecasting crime rates with an error of 10 percent to 20 percent.

After the Rochester field test is complete, the team will develop a version of the software for general distribution to police departments nationwide.

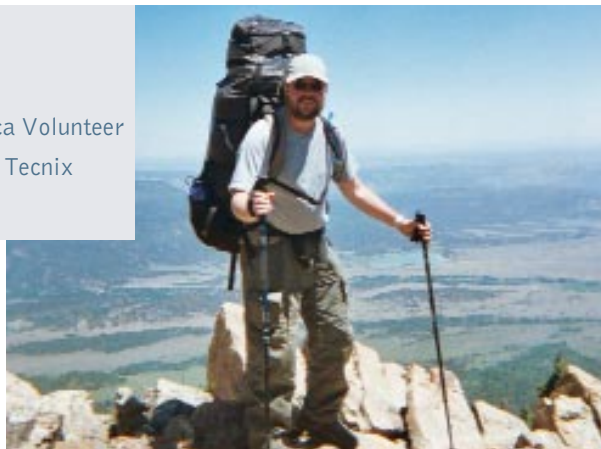
UNCOMMON IE

# Scouting for adventure

Mario Martinez is co-founder and managing partner of Tecnix and TechGeorgia Nexus, providers of technology sourcing and executive recruiting services. He holds a B.S. in industrial engineering from Florida International University. In his spare time, Martinez volunteers extensively with the Boy Scouts of America, an organization he feels echoes the tenets of industrial engineering.

## MARIO J. MARTINEZ

Boy Scouts of America Volunteer  
Managing Partner of Tecnix  
Atlanta



**IIE:** How did you get involved with the Boy Scouts of America?

**Martinez:** I first got involved in scouting when I was 11 years old, with Troop 62 in Miami. As an adult I got involved with my son in Boy Scouts because it is a great program to teach leadership and self-reliance. It is also a lot of fun. It is very rewarding to have a small part in helping boys become men of character and substance.

**IIE:** Describe your work with the BSA.

**Martinez:** I am a volunteer, as are most Scout adult leaders. I have been involved in a number of activities ranging from membership on the Hispanic Emphasis Advisory Board for the Atlanta Area Council of the Boys Scouts to serving as a scoutmaster for a minority scout troop. I also serve as assistant scoutmaster for troop 1717 in charge of a Venture Patrol focused on high-adventure programs. Additionally, I have received some excellent training from the Boy Scouts, including the most recent program for adult leaders, Wood Badge for the 21st Century. This program uses many of the concepts of

leadership as taught by Stephen Covey, Ken Blanchard, and other current management thinkers.

**IIE:** Boy Scouts follow the motto “Be prepared.” Do you feel the organization provides a good foundation for future industrial engineers?

**Martinez:** Boy Scouts learn how to properly use resources, and those resources are manpower, materials, and equipment. They learn how to plan their time for maximum results for themselves, their team, and their community. This sounds to me an awful lot like an industrial engineer’s job description. I think it is a great foundation for life in general as Boy Scouts learn to become self-reliant and yet work in teams. They develop a good moral compass and learn how to work with people, equipment, and material within time and budget constraints. As engineers we are often “accused” of being Boy Scouts. Both engineers and Scouts have a reputation for truthfulness and doing the right thing.

— Steven Averett

SITE TO SEE

# Perchance to dream

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# UPS invests for speedier delivery



Smart labels on packages are read by cameras that allow the system to identify and route packages to their final destination.

UPS unveiled a new \$30 million technology system in September that will improve customer service and provide greater internal efficiency, including simplification of work and training. The suite of package flow technologies includes software, hardware, and process changes.

“These technologies will lead to major advances in service and efficiency, not just incremental improvements,” Chief Information Officer Ken Lacy said during a technology summit at the UPS Worldport hub in Louisville, Ky. “At UPS, technology is so closely interwoven with the business that it powers every service the company offers and every operation it performs.”

Testing and initial deployment also suggest UPS can reduce delivery truck mileage by more than 100 million miles each year. That would save the company 14 million gallons of fuel and reduce carbon dioxide emissions by 130,000 metric tons annually.

The foundation for the new system is the “smart label” affixed to packages. More than 90 percent of UPS customers generate these labels at their premises. Information from the label is transmitted to UPS before the package is even picked up by a driver. Consequently, address information on a package can be pre-processed and corrected if necessary before the arrival of the package at the sorting center. >>>

<<< Advance information also automates two key processes: planning the daily delivery route and the process of loading vehicles.

UPS employees loading trucks today must learn hundreds of addresses or ZIP codes for each delivery area. With the new software, training requirements will be reduced since each package will arrive with specific instructions indicating where it should be placed inside which delivery vehicle.

The driver's job is also simplified by enabling him or her to view all packages in delivery order, indicating exactly where the packages are loaded in the truck.

Critical information flows to the driver's wireless, handheld computer, now in its fourth generation. Among the functions it performs is alerting the driver that a delivery time commitment nears.

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The solo patrols, combined with Chelst's shift schedule, will eventually save the financially strapped city \$10 million to \$12 million a year if the labor package already accepted by the police union is approved by the state authority overseeing Buffalo's finances, Matarese says. Full implementation of the plan will reduce the police force after four years through retirement and attrition from 875 to 673 officers.

Data on an average summer night using the old system indicated that only three or four patrol cars out of 33 were available for immediate dispatch. In fact, some non-life threatening calls on busy nights never got serviced when back loads occurred, according to Matarese.

Studying the data, Chelst found that the heavy volume of calls police management thought occurred after 9 p.m. actually happened about 5 p.m. Quality of life calls, such as barking dog complaints, tended to tie up two officers at a time.

Using linear programming, Chelst devised a shift schedule using five overlapping starting times throughout the 24-hour work cycle. The officers still work 10-hour shifts but cover the city more efficiently. With the changes, 10 to 29 patrols are now available for immediate dispatch. Officers riding alone are quickly backed up by other patrol cars flocking to crime scenes.

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