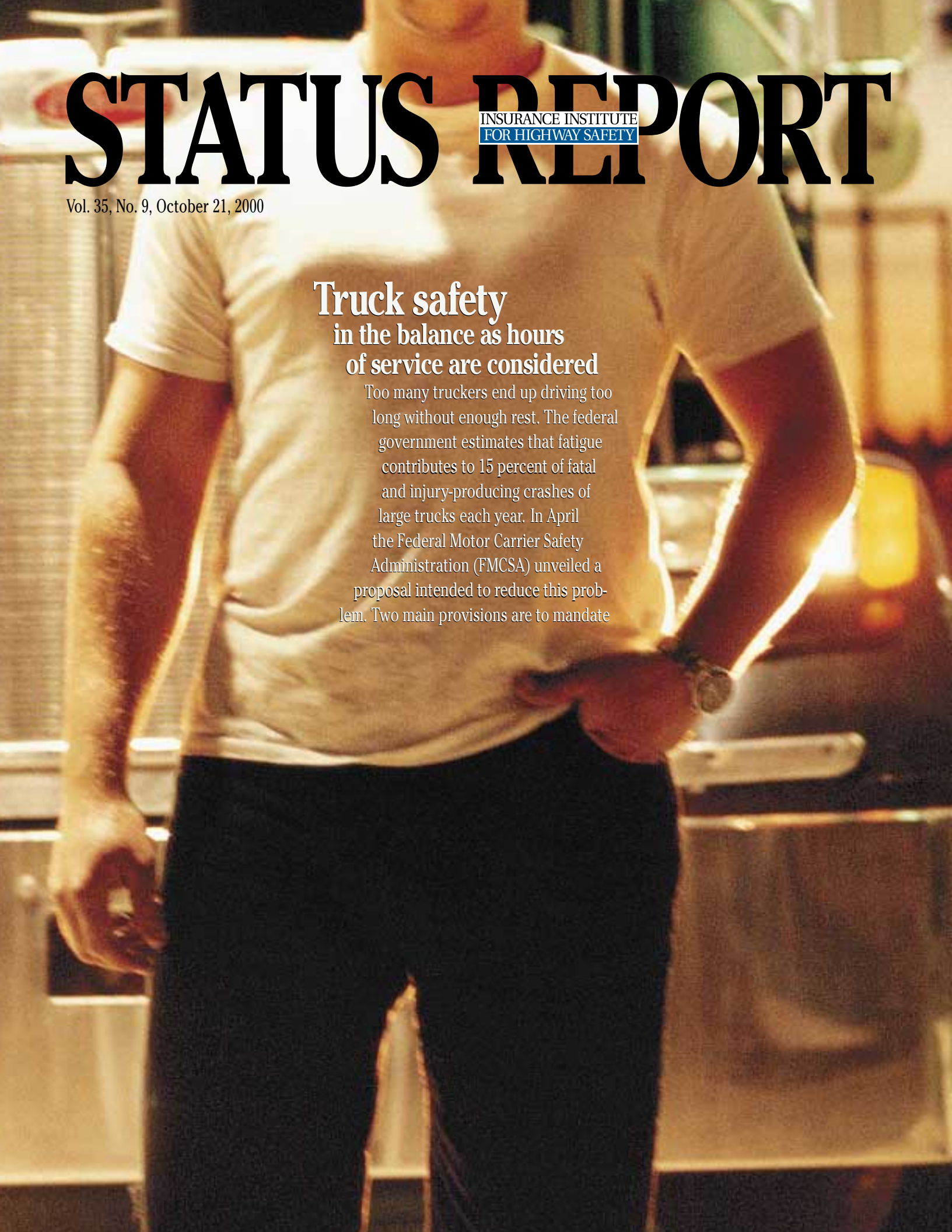
STATUS REPORT
INSURANCE INSTITUTE FOR HIGHWAY SAFETY
Vol. 35, No. 9, October 21, 2000



Truck safety in the balance as hours of service are considered

Too many truckers end up driving too long without enough rest. The federal government estimates that fatigue contributes to 15 percent of fatal and injury-producing crashes of large trucks each year. In April the Federal Motor Carrier Safety Administration (FMCSA) unveiled a proposal intended to reduce this problem. Two main provisions are to mandate

longer off-duty time for truckers and require electronic recorders to enforce the rules. The proposal also would increase the hours truckers can drive at a stretch. The Institute and other safety groups support the first two provisions but not the third one.

FMCSA faces far greater opposition from the trucking industry, which is lobbying hard against the proposal, saying it would push up shipping costs, economically devastate some carriers, and lead to more crashes. Already the industry has won ground. A Senate appropriations panel tried to ban the rulemaking altogether, leading to a compromise. Now FMCSA cannot issue a new hours-of-service rule for another year. Meantime, eight hearings and three roundtables have been convened to open dialogue, but the atmosphere is tense. The industry views the proposed rule changes as another front in the "regulatory war" against trucking, while FMCSA in its first independent year is under pressure to show it can regulate effectively.

Institute president Brian O'Neill characterizes the plan on the table as "a reasonable compromise. While we don't like the idea of truckers spending 12 hours behind the wheel, the longer periods of mandatory rest plus the requirement for on-board recorders make this a positive proposal on balance."

Under current rules, truckers may drive as many as 16 hours a day — up to 10 at a stretch — with only 8 hours off between shifts. Research indicates that crash risk increases considerably after 8 to 10 driving hours, so both the current rules and the new proposal allow too many hours behind the wheel. But under the rules now in effect, truckers routinely drive longer than is legal because it's so easy to falsify paper logbooks (see *Status Report*, Sept. 12, 1998).

Economic incentives to exceed maximum hours are strong for motor carriers as well as drivers, most of whom are paid by the mile or load, not the number of hours worked. Falsification is so common that surveys show most truckers admit logbooks are inaccurate.

Recorders are needed: The key aspect of FMCSA's proposal is that it should reduce the rampant falsification of driving hours. Electronic recorders (see facing page for description) would replace handwritten logbooks on all long-haul rigs. Institute senior researcher Elisa Braver applauds this, saying "any effort to improve hours-of-service rules would be meaningless without requiring tamper-resistant recorders." Four times since 1986 the Institute has petitioned the federal government to require on-board recorders.

Work hour changes needed: FMCSA proposes to limit truckers' daily work time to 12 hours. With no distinction between driving and nondriving duties, all 12 hours could be spent behind the wheel — 2 hours longer than allowed at a stretch under current rules. "Unlike most of the new proposal, the provision to allow truckers to go 12 hours makes

little sense given what is known about driving hours and crash risk," O'Neill notes.

Truckers' daily off-duty time would be extended from 8 to 12 hours — a 10-hour period each day plus 2 hours that could be taken in half-hour breaks during the work day. Drivers also would be required to take a longer break once a week that includes 2 consecutive nights off. These provisions are well supported by research. The consensus is that the current 8-hour off-duty period doesn't allow enough time for sleep, especially among nighttime drivers who try to sleep during the day. The result is that many truckers accumulate sleep deficits that progressively hinder performance.

Long-standing industry opposition: Last year the American Trucking Associations submitted a proposal for 14 work hours, all of which could be spent driving, plus a 10-hour break. There was no provision for on-board recorders to help enforce the rules. Now that FMCSA has proposed contrary provisions, the industry group wants the agency to go "back to the drawing board."

A great deal of the criticism is directed at recorders. For example, Todd Spencer of the Owner-Operator Independent Drivers Association describes the mandate as "a heavy-handed, overzealous attack by government bureaucrats on the constitutional rights of professional truckers." Aware of the privacy arguments, FMCSA says recorders would supply "a more effective form of the self-monitoring and reporting drivers have been required to perform for many decades in the form of paper records."

Other opponents say recorders are too costly at $1,500 to $3,000. Yet some manufacturers are advertising electronic recording devices that would meet proposed requirements for $500 or less. Many carriers — as many as 26 percent, according to a 1997 survey in New York — already are using technology that could be adapted to the government's proposed requirements. Motor carrier executives and drivers who use recorders instead of paper logbooks say they save a lot of time and money. State trucking associations in Arkansas, California, and Tennessee are among the relatively few industry representatives that openly support the proposal to require recorders.

With nearly 20,000 comments submitted to FMCSA and a rulemaking that will go on for at least another year, the agency faces a lot of work. "Experience suggests the process won't be quick or easy," O'Neill concludes.

What's an on-board recorder?

It combines the functions of a speedometer, odometer, and employee time clock — all wrapped up in a dashboard instrument about the size of a tape deck. On-board recorders keep track of vehicle speed, mileage, duration of travel, and number and duration of stops as well as time and day. They typically track who's driving via smart cards or other driver inputs. Information about driving hours is accessible by motor carrier or enforcement personnel.

These are the basic requirements for on-board recorders in the Federal Motor Carrier Safety Administration's hours-of-service proposal.

Electronic recorders differ in technology, but not purpose, from older tachographs, which mechanically record data on circular paper graphs. Such devices are mandatory in large commercial vehicles in European Union countries as well as Brazil, Israel, Japan, South Korea, Turkey, and Venezuela. At least six other nations have partial legislation or are considering a mandate. The European Union will require electronic recorders in all new commercial trucks by 2002.

It's important to distinguish on-board recorders in trucks from so-called "black boxes," also known as event recorders. The latter are used specifically for crash analysis and accident reconstruction, while the recorders being proposed by the Federal Motor Carrier Safety Administration would track primarily truck drivers' hours.

Some on-board recorders do keep event data, and some work with global positioning systems to help motor carriers pinpoint the locations of their truck rigs. Other recorders include engine monitoring systems to improve maintenance. Some are linked with wireless routing and navigation systems. These capabilities add convenience as well as cost, but no such functions would be required.

Advanced driving simulator is costly, value is questionable

Behind schedule and costing about $60 million so far, the government-owned National Advanced Driving Simulator (NADS) operated by the University of Iowa is about to come online. Its sponsors may be gearing up to celebrate, but others still are asking the question that has plagued the project from the start: Why is so much money being spent on something with no proven value for highway safety research?

A longtime skeptic is Institute president Brian O'Neill (see *Status Report*, April 20, 1996). "Not only was this simulator expensive to build, it will cost a lot to operate," he points out. "No matter how sophisticated it is, the subjects in it will know they're being studied, so researchers will never know if they're observing normal behavior or, what's more likely, special behavior. Simulators violate a basic principle of behavioral research — people often behave differently when they know they're being observed."

Leonard Evans, recently retired senior research scientist at General Motors, shares this view. "Crashes have more to do with driver behavior than driver performance, and the only thing you measure on a simulator is performance. By the very nature of the process, people are performing a task." Evans says he knows of no important research findings from high-level simulators.

"There's not much that can be studied on a simulator that can't be done through simpler means," Evans also says. One presumed advantage of simulators is that drivers can be put in situations where crash risk is high. But, as Evans points out, "suppose you had a magic vehicle that had the property that after a crash, all human and mechanical harm was instantly canceled. What list of wonderful research studies could you do with it? I'm not saying the list is empty, but there's not a lot on it."

Crash avoidance researchers at the National Highway Traffic Safety Administration (NHTSA), where NADS originated, disagree. Although NADS won't be officially unveiled until later this year, NHTSA already has requested $4 million for two studies in 2001. One will look at driver distractions, and the other will focus on the effects of alcohol under demanding driving conditions.

Michael Goodman, the human factors researcher at NHTSA who will head these studies, admits validity is a concern but says "we're going to have a minimal problem" with that. "We believe it will be a very compelling driving experience, compelling in the sense of being very realistic. I think subjects will be absorbed in the task and won't focus on the fact they're being observed." He says the agency plans to add a validation component to each project. This will consist of performing tasks on the simulator and then taking corresponding on-the-road measures, checking for differences that suggest the simulation isn't valid.

This approach to validation "makes no sense," O'Neill counters. "If you can observe the behavior on the road, why do you need the simulator? The advocates of the simulator need to go back and study the principles of scientific experimental design. Simulators violate those basic principles."

Quest to build a better machine: While NHTSA's first batch of NADS-based studies still are in the planning phase, the focus has been on the technical challenges of building the machine, housed at the University of Iowa's Oakdale Research Park.

NADS is billed as more technologically advanced than either its U.S. predecessor, the Iowa Driving Simulator, or the world's only other advanced driving simulator, DaimlerChrysler's in Germany. The key technical innovations involve NADS' motion base and the fidelity of simulation — how closely it approximates the real thing.

A distinguishing feature of the motion system is its capability for large excursions, which are made over a grid of rails and belts. These slide the simulator dome, which is big enough to hold a truck tractor, up to 64 feet laterally and lengthwise across the room. The dome itself sits on six hydraulic legs that move up and down to simulate pitch and roll, and a rotating platform inside the dome reproduces spin.

Another advancement is the visual system with its 360-degree field of view so test drivers can see the simulation ahead, to the sides, and in all three mirrors. The graphics

are more realistic than those of the best computer video game, according to NHTSA.

High-end computers run all subsystems simultaneously — motion, visual, sound, plus the dynamics specific to the vehicle being simulated. NHTSA says NADS can copy the dynamics of a Ford Taurus, Chevrolet Malibu, Jeep Cherokee, and Freightliner Class 8 truck cab.

$34 million price tag was only the start: Complexity adds to the price. The University of Iowa's software contribution is valued at about $5 million. TRW's contract to build NADS was worth $34.1 million. With "cost growth," this contract now stands at about $50 million, considerably more than NHTSA's initial $32 million estimate.

Operational costs will be hefty, too. Revenues are expected from rental fees of $1,000 per hour. But from the beginning, congressional leaders and others have been skeptical that there will be enough private users to generate the $9 million a year needed to keep NADS running.

Government users, mainly NHTSA but also including the Federal Highway Administration and Federal Motor Carrier Safety Administration, will have access to two-thirds of the rental time. The University of Iowa will get to market the rest of the time to private users. Many of these users probably will be in agriculture or defense, not highway safety.

Keith Brewer, who directs NHTSA's Office of Human-Centered Research, says the motion base and higher fidelity cueing systems added much of the cost. The agency wanted these to enhance realism and particularly to minimize simulator-induced sickness, a major problem with any simulator. Brewer says it isn't known whether this side effect will be eliminated using NADS.

Genesis of a flawed project: The idea of a government-funded advanced driving simulator began with Michael Finkelstein, NHTSA's Associate Administrator for Research and Development during the late 1980s. He recalls that "there was the expectation that there would be a lot of advanced technology moving into cars" such as antilock brakes and adaptive suspension systems. "The issue was, when I put advanced technology into a vehicle, how is the driver going to respond? If I put more capability in, is it going to have a safety benefit?"

Finkelstein says the simulator seemed like a reasonable way to anchor a large-scale crash avoidance research program on par with the crashworthiness program. According to NHTSA's 1993 budget justification, the driving simulator "will be to crash avoidance what the anthropometric dummy is to crashworthiness."

But Leonard Evans says this analogy "reveals a profound misunderstanding of what traffic crashes are all about. Research in crash avoidance and research in crashworthiness do not involve the same issues. A vehicle crashes into a wall the same way each time. It's reproducible. There's no behavioral element there. But obviously crash avoidance does have to do with the human element. It's very alarming that those with responsibility for the nation's safety can reveal so deep a misunderstanding."

Once NHTSA officials began considering the simulator, they primarily consulted simulator experts in commercial aviation and defense. This illustrates "another major misunderstanding," O'Neill points out. "Flight simulators are training devices, not research tools. They're valuable for training pilots to fly expensive planes and how to react in specific emergencies such as loss of power. It makes sense to train pilots this way because it's cheaper than using a real plane. But no one contends that it makes sense to train car drivers in a $60 million simulator."

Without any direct evidence that NADS would be useful for research, NHTSA's quest for it succeeded. Now that research is about to begin, the debate turns back to issues of validity and cost. "It's a 60 million dollar gamble," O'Neill says, "and it's not a good gamble at all because it's likely people won't behave the same in a simulator as they do in their everyday driving."

Types of pedestrian crashes have changed since the 1970s

There should be widespread implementation of measures to reduce conflicts between turning vehicles and pedestrians at urban intersections. This is the conclusion of a new study, sponsored by the Institute, that takes a fresh look at where and how pedestrians are being struck.

Pedestrians accounted for 13 percent of motor vehicle deaths in 1998. The problem is worst in urban areas, where 68 percent of pedestrian deaths occur. As big a problem as this is, it represents an improvement since 1976. Pedestrian deaths have declined 30 percent since then compared with a 5 percent decline in all other vehicle deaths.

Fewer deaths among young people: There are other changes, too. Twenty-three percent of all fatally injured pedestrians in 1976 were younger than 15. Now only 10 percent are that young. At the same time, the number of pedestrian deaths among 30-49 year-olds has increased. This shift indicates a change in the crash types that are occurring, says Institute senior vice president Allan Williams. "We see many fewer children running into the street and being struck—so-called midblock dart-dash crashes—but we're also seeing more adults who are legally crossing at intersections and being hit by turning vehicles."

Researchers collected 1998 crash statistics from Baltimore and Washington, D.C. In Washington, similar data were collected in 1976, allowing the direct comparisons. In the mid-1970s, midblock dart-dash crashes made up 37 percent of pedestrian crashes in Washington. By 1998, the proportion had declined to 15 percent in Washington and 18 percent in Baltimore. Twenty-five percent of all Washington pedestrians involved in crashes during 1998 were 14 or younger, compared with 46 percent in 1976.

Turning-vehicle crashes increased from 9 percent of Washington's pedestrian crashes in 1976 to 25 percent in 1998. These impacts involved primarily pedestrians 25 years and older.

Who's at fault? Researchers found the pedestrians culpable in 50 percent of crashes. Drivers were at fault in 39 percent. Both were found culpable in 1 percent, while culpability was unknown in the other 10 percent of crashes.

Pedestrians were almost always judged culpable in midblock and intersection dash crashes, the kind involving a pedestrian who appears suddenly in the path of a vehicle. But among the other crash types identified — turning vehicle, vehicle backing up, and pedestrian not in road — drivers usually were more at fault.

Measures to reduce crashes: "The development of safety measures in the 1970s and '80s focused primarily on child pedestrians because of the prevalence of midblock dart-dash crashes," says David Preusser of the Preusser Research Group, which conducted the study. "Today we need a new focus on measures that will reduce the number of pedestrians hit by turning vehicles." For example, traffic signals can be changed to let pedestrians begin crossing a street several seconds before turning vehicles get a green light. Stop lines can be placed farther back from crosswalks at traffic signals to increase the time it takes for the first vehicles to enter intersections. Such measures, "have great potential to improve the problem of turning vehicles hitting pedestrians, but they're not widely used," Williams notes (see *Status Report*, March 13, 1999; on the web at www.highwaysafety.org).

For a copy of "Pedestrian crashes in Washington, D.C. and Baltimore" by D.F. Preusser et al., write: Publications, Insurance Institute for Highway Safety, 1005 N. Glebe Rd., Arlington, VA 22201.

Three-point safety belt is American, not Swedish, invention

New book debunks a myth that's been around for decades

Sometimes it's important to set the record straight, giving credit where it's due. This is among the aims of two Swedish researchers who say the three-point belt system, long assumed to be the brainchild of Swedish automaker Volvo, rightly should be considered an American invention.

Roger W. Griswold and Hugh DeHaven designed and patented the first three-point belt in the United States in 1951. It's essentially the same belt system that's in use today, a combination lap belt and diagonal shoulder portion designed as a continuous strap. This design was the basis for the single-band lap/shoulder belt offered as standard equipment in Volvos starting with 1959 models.

Volvo's decision to install such belts gave rise to the widely held, but incorrect, impression that the three-point safety belt is a Swedish innovation, Rune Andreasson and Claes-Goran Backstrom explain in a new book.

"That Sweden … has been able to make a pioneering global contribution to the safety of automobile travel is something to be proud of," the authors say. "In addition, we feel great satisfaction at having been able to clarify who should receive the honors for having developed the modern automotive seat belt."

History of the three-point belt: Griswold had worked on such a belt for the American Air Force in 1945. DeHaven was a combat pilot during World War I who later conducted research on deceleration. Further research on the ability of humans to tolerate rapid and sudden deceleration was conducted by another American, Air Force Colonel John Paul Stapp.

But American carmakers showed little interest in safety belts at the time this research was going on. U.S. manufacturers were offering lap belts only as optional equipment in the mid-1950s. Lap belts didn't become standard equipment in the United States until 1964 (see *Status Report*, Feb. 29, 1992), and then only in response to state laws requiring them.

From the work by DeHaven and others, safety belt development switched to Sweden in the early 1950s as part of an industrial safety plan of the State Power Board in Sweden, now known as Vattenfall. Andreasson and Backstrom explain that Vattenfall was interested in protecting workers in company vehicles as part of its occupational safety program.

Using the research by DeHaven and Stapp, two engineers at Vattenfall constructed a two-point, or diagonal, automotive safety belt. At the same time, they indicated that a three-point belt — a combination of the two-point belt plus a lap belt — would provide even more effective protection.

A medical advisor to Vattenfall contacted the head of Volvo in 1956 and presented the idea of equipping cars with safety belts. As a result, Volvo installed two-point belts in 1958, as did Swedish automaker Saab. Beginning with 1959 models, Volvo made three-point belts standard.

Volvo sought a Swedish patent for the belt based on research and development conducted by Vattenfall, whose work, in turn, was based on the earlier work by the Americans. According to the authors, 11 years of disputes finally led to a patent for Volvo — not for the belt design itself but for a "fitting application for a three-point belt."

Belt installation lagged in United States: Lap and shoulder belts were legally required in the front seats of cars in the United States beginning in 1968. But no specific design was mandated, and most domestic models were equipped with separate lap and shoulder belts. Occupants had to buckle each separately, and the failure to use one or the other portion compromised protection.

Three-point safety belts weren't widely available in the United States until a federal law began requiring them in 1973. Now such belts are acknowledged as the single most effective safety device in passenger vehicles — when they're buckled up.

About the authors: Rune Andreasson and Claes-Goran Backstrom are medical doctors who have focused on occupant safety and injury prevention throughout their careers. Backstrom interned under Stig Lindgren, the Vattenfall medical advisor who suggested that Volvo install safety belts. Lindgren also served as a mentor to Andreasson, with whom he later collaborated.

To order *The Seat Belt: Swedish Research and Development for Global Automotive Safety* (book available in English), write: Vattenfall Support AB, B. Lagerstrom, SE-16287 Stockholm, Sweden (fax 46-8-739-5627 or email: info@vattenfall.se). The cost is $20.

STATUS REPORT

INSURANCE INSTITUTE FOR HIGHWAY SAFETY

1005 N. Glebe Rd., Arlington, VA 22201
703/247-1500 Fax 247-1588
Internet: www.highwaysafety.org
Vol. 35, No. 9, October 21, 2000

ISSN 0018-988X

The Insurance Institute for Highway Safety is an independent, nonprofit, scientific and educational organization dedicated to reducing the losses — deaths, injuries, and property damage — from crashes on the nation's highways. The Institute is wholly supported by automobile insurers:

Alfa Insurance
Allstate Insurance Group
American Express Property and Casualty
American Family Insurance
American National Property and Casualty
Amica Mutual Insurance Company
Amwest Insurance Group
Auto Club South Insurance Company
Automobile Club of Michigan Group
Baldwin & Lyons Group
Bituminous Insurance Companies
Brotherhood Mutual
California Insurance Group
California State Automobile Association
Cameron Companies
CGU Insurance
Chubb Group of Insurance Companies
Church Mutual
Colonial Penn
Concord Group Insurance Companies
Cotton States
Country Companies
Erie Insurance Group
Farmers Insurance Group of Companies
Farmers Mutual of Nebraska
Fidelity & Deposit
Foundation Reserve Insurance Company
Frankenmuth
The GEICO Group
General Casualty Insurance Companies
GMAC Insurance Group
Grange Insurance
Harleysville Insurance Companies
The Hartford
Idaho Farm Bureau
Instant Auto Insurance
Kansas Farm Bureau
Kemper Insurance Companies
Liberty Mutual Insurance Group
Merastar
Mercury General Group
MetLife Auto & Home
Middlesex Mutual
Montgomery Insurance Companies
Motor Club of America Insurance Company
Motorists Insurance Companies
MSI Insurance Companies
National Grange Mutual
Nationwide Insurance
North Carolina Farm Bureau
Northland Insurance Companies
Oklahoma Farm Bureau
Old Guard Insurance
Oregon Mutual Group
OrionAuto
Palisades Safety and Insurance Association
Pekin Insurance
PEMCO Insurance Companies
The Progressive Corporation
The Prudential
Response Insurance
Rockingham Group
Royal & SunAlliance
SAFECO Corporation
SECURA
Shelter Insurance Companies
State Auto Insurance Companies
State Farm Insurance Companies
The St. Paul Companies
Tokio Marine
USAA
Virginia Mutual Insurance Company
Warrior Insurance Group
Yasuda Fire & Marine of America
Zurich U.S.