

STATUS REPORT

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FOR HIGHWAY SAFETY

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**Above: all drivers must stop
Left: traffic flows through**

Probably why drivers come to favor roundabouts

Modern roundabouts (shown left) reduce motor vehicle crashes — a big safety plus. Another important plus, compared with the stop signs that roundabouts often replace, is a reduction in dreaded traffic delays by eliminating the requirement for all motorists to stop. These are the probable reasons that even motorists who didn't like the idea

of roundabouts to begin with end up liking them once they're installed and drivers navigate them a few times.

The finding that roundabouts reduce crashes, including injury crashes, isn't new. An Institute study found a 75 percent reduction in injury crashes at roundabouts converted from stop signs or signals (see *Status Report*, May 13, 2000; on the web at www.highwaysafety.org). What's new is that roundabouts also reduce delays at U.S. intersections. This is a main finding of a recent Institute study conducted by researchers at Kansas State University, who measured traffic flow at three intersections in Kansas, Maryland, and Nevada before and after conversion to roundabouts.

"In each case, installing a roundabout reduced the amount of traffic having to stop at the intersection, leading to about a 20 percent reduction in delays," says Richard Retting, the Institute's senior transportation engineer. The proportion of vehicles having to stop declined 14 to 37 percent across all three sites. In turn, backups on the approach streets declined at all three sites, and delays per vehicle dropped 13 to 23 percent.

These improvements were found at intersections where roundabouts replaced stop signs — the main use of roundabouts so far in the United States. Other studies have found substantial traffic flow improvements at intersections where roundabouts replaced traffic signal lights.

Reduced stopping means fewer traffic delays: "Stopping is the number one cause of delay at intersections, so when you eliminate the requirement to stop, you reduce delays," Retting explains. "Because roundabouts keep most traffic moving, they can handle more traffic in the same amount of time compared with stop-controlled intersections. Traffic might only be moving at 15 mph, but even with the reduced speeds it's more efficient because you're not requiring every vehicle to come to a complete stop."

A roundabout also improves access to intersections for motorists approaching from minor roads. This helps to reduce delays that can occur when volume is a lot heavier on some approaches than others. Stop signs and signals are less efficient because they require at least some traffic to stop. They're also less safe.

"The most serious kinds of crashes at conventional intersections are virtually eliminated by roundabouts," Retting points out. "Crashes that do occur tend to be minor because traffic speeds are slower."

Experience changes opinions: Roundabouts still haven't been as fully accepted in the United States as elsewhere. For example, they're widespread in the United Kingdom and engineers in France are building upwards of 1,500 new roundabouts per year. Public resistance in the United States is part of the problem, but the resistance is expected to fade as more communities build roundabouts. Public opinion surveys conducted in the three communities show more than a doubling of support for roundabouts after they're built.

For a copy of "Public opinion and traffic flow impacts of newly installed modern roundabouts in the United States" by R.A. Retting et al. write: Publications, Insurance Institute for Highway Safety, 1005 N. Glebe Rd., Arlington, VA 22201.

Drivers may think the

American motorists often say they don't like roundabouts, but experience quickly wins them over. This is a main finding of a new survey conducted for the Institute. Twice as many drivers favor roundabouts after installation, compared with before.

Researchers first surveyed drivers in three communities in Kansas, Maryland, and Nevada where roundabouts were to be constructed. Follow-up surveys conducted a few months after installation show opinions had changed dramatically. The proportion of drivers in favor doubled overall, from 31 percent before construction to 63 percent after. Those who were strongly opposed dropped from 41 percent to 15 percent.

Each time drivers were surveyed, those against roundabouts were asked the reasons for their opposition. About one-third of opposed drivers in the first survey said they would prefer a new traffic signal or to keep the stop signs that were already in place. Another 40 percent cited concerns about safety or confusion at the new intersections. After the roundabouts were constructed, objections were similar but only half as many drivers were opposed.

Before and after construction, drivers were asked about the impact of roundabouts on congestion and safety. Before construction, 27 percent of the drivers thought congestion would be reduced. After construction, 42 percent thought it had been reduced. About a third of the drivers

They won't like roundabouts, but they end up being fans

questioned before construction thought there would be a safety improvement, and the proportion increased to 50 percent after roundabouts were installed.

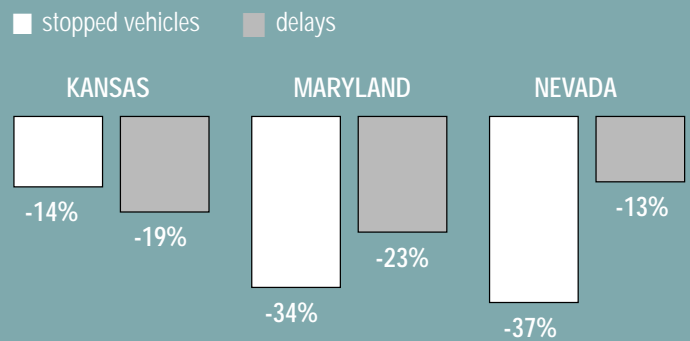
"Many drivers simply prefer the traffic controls they're more familiar with. There's a natural resistance to the unknown," says Richard Retting, the Institute's senior transportation engineer. "Still, some of the concerns we heard are based on real misunderstandings." For example, far from being unsafe roundabouts significantly reduce crashes (see *Status Report*, May 13, 2000; on the web at www.highwaysafety.org).

Communication is important to overcome biases and build support for roundabouts before they're operational, Retting also notes. But this only goes so far because, for many people, seeing is believing. Eugene Russell, professor at Kansas State University's Department of Civil Engineering and a co-author of the study, says that "at first communities say, 'We don't want roundabouts here. We don't need them just because England or France has them.' But after the roundabouts are in, communities like them because they work."

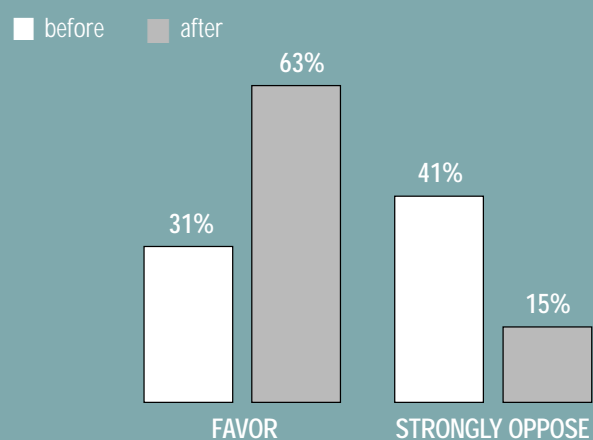
This is what happened in University Place, the first city in Washington State to build a modern roundabout. Public

works director Steve Sugg says a demonstration was important to secure wide support. "Initially we had to overcome strong public opposition," he says. "To try something this new and innovative required a heck of a lot of public involvement — more than I had ever been exposed to in my career. But in the end, people came around, and all of that effort paid off. Now we have five roundabouts, and they're actually a source of pride for the citizens in the community."

Percent reductions in traffic delays and stopped vehicles after roundabouts



Percent of drivers who favor and oppose roundabouts before and after construction



Special report

Balanced approach to highway safety still isn't appreciated by all

Note: Until the 1960s, highway safety efforts focused almost exclusively on preventing crashes by changing driver behavior. Such efforts rarely were evaluated. A pioneer in the successful effort to introduce a balanced approach, underpinned by scientific evaluations, was William Haddon, Jr., M.D., head of the first federal highway safety agency (1967-69) and president of the Insurance Institute for Highway Safety (1969-85). For the past 40 years or so, the field of highway safety has focused on loss reduction measures involving not only drivers but also vehicles and roads. Still, some people claim Haddon and others engineered an almost exclusive swing toward re-designing vehicles. They say driver measures began to be neglected, which hampered U.S. progress toward reducing crash deaths and injuries. This view was most recently propounded in a long magazine article by Malcolm Gladwell ("Wrong Turn," The New Yorker, June 11). The magazine publishes only short rebuttals, so Status Report offers the following response from Institute president Brian O'Neill.

According to Gladwell, highway safety policy in the United States took a "wrong turn" largely because it was influenced by William Haddon, Jr., who believed "that the best way to combat the epidemic on the highways was to shift attention from the driver to the vehicle." Gladwell claims highway safety orthodoxy for much of the last century "held that safety was about reducing accidents —

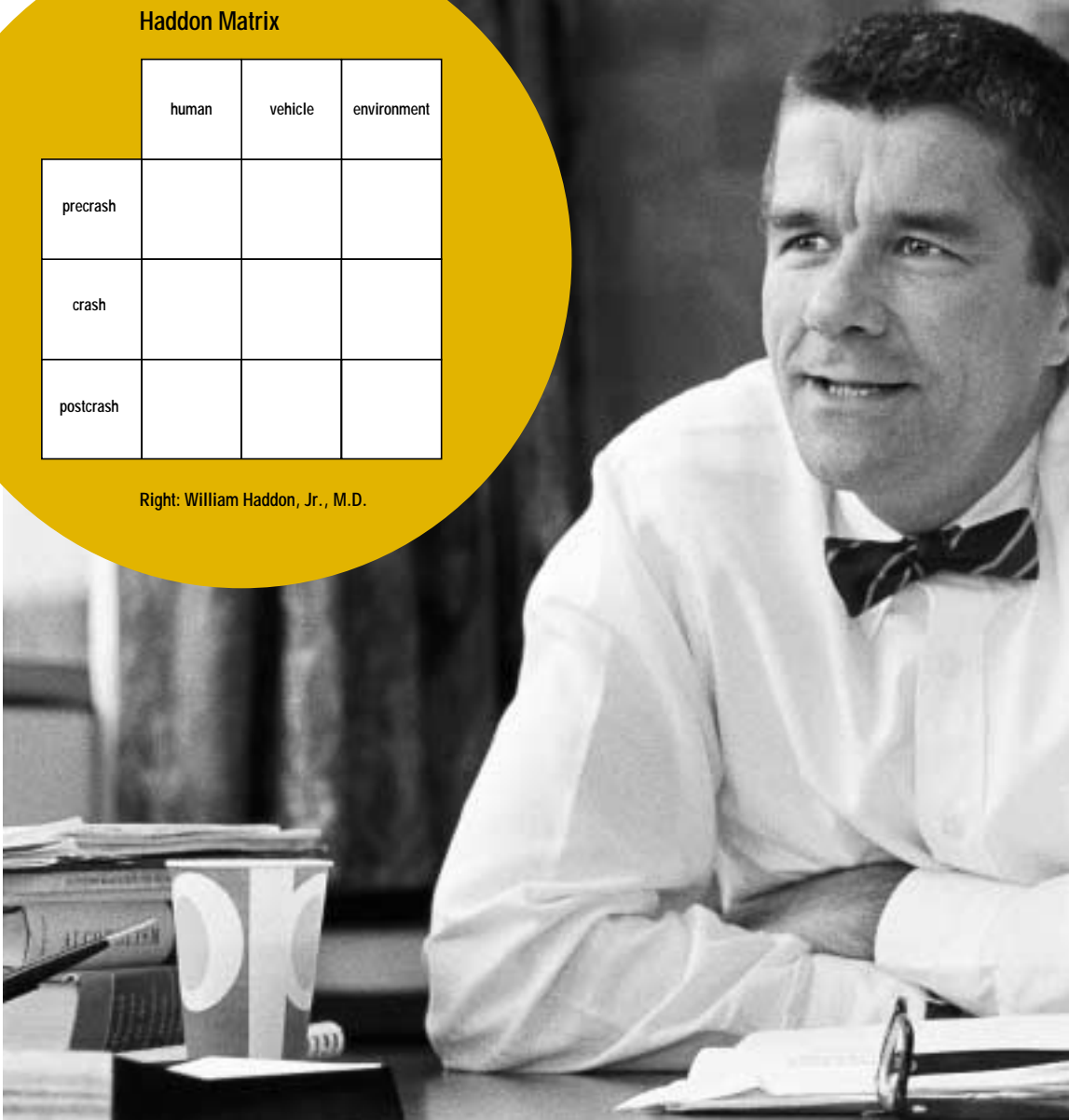
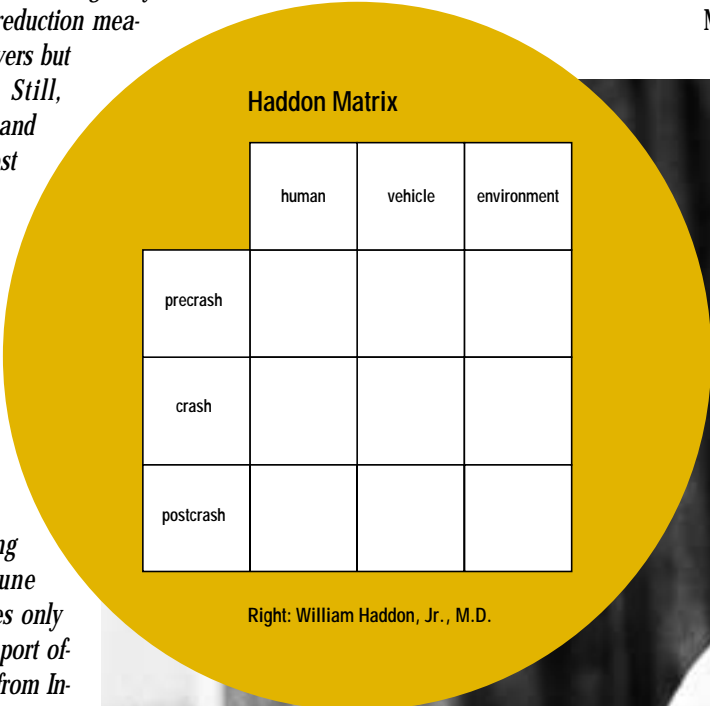
educating drivers, training them, making them slow down. To Haddon this approach made no sense. His goal was to reduce the injuries that accidents caused. In particular, he did not believe in safety measures that depended on changing the behavior of the driver."

The first part of this claim is correct. Until the late 1960s, "orthodox" highway safety was *only* about preventing accidents. But the second part of the statement couldn't be further from the truth. Haddon believed there should be a systematic and balanced approach including measures to prevent crashes, reduce injuries during crashes, and reduce the consequences after crashes.

Today all students of injury control are familiar with the Haddon matrix, a tool to help systematically identify all options available to reduce injuries. Some of these options involve changing human behavior.

Gladwell is correct that "Haddon believed the best safety measures were passive." But Haddon didn't believe these were the only measures that could be effective. He strongly advocated those that scientific research demonstrated were effective — and science (then and now) showed most of the orthodox approaches of the day didn't work.

The "wrong turn" the United States supposedly took was to pass legislation in the late 1960s authorizing the federal government to set safety standards for new cars. Most, but not all, such standards resulted



in “passive” safety features in vehicles. But the standards also included requirements for active safety features such as lap/shoulder belts. The passive features that required no action on the part of occupants included energy-absorbing steering columns, laminated windshields, side door beams, etc. Such features have saved thousands of lives, as have federally mandated lap/shoulder belts.

“No other country pursued the passive strategy as vigorously,” Gladwell claims. Yet a few years after the introduction of the first new vehicle safety standards in the United States during the late 1960s and early 1970s, almost identical vehicle standards were adopted in Canada, Europe, and Australia.

What Gladwell fails to mention is that at the same time the U.S. Congress passed the legislation that authorized federal vehicle safety standards, it passed companion legislation to establish standards for state highway safety programs. As head of the first federal highway safety bureau, Haddon issued 13 such standards that addressed issues including alcohol-impaired driving, driver licensing, and motorcycle helmet use. This was part of the balanced approach — addressing road users and vehicles — that Haddon strongly believed in.

way safety programs. Today only 21 states have motorcycle helmet use laws.

This one example illustrates why some other countries have been more successful than the United States in reducing some kinds of motor vehicle crash deaths and injuries. While U.S. states were repealing helmet use laws, other countries, which already had helmet laws, were adopting seat belt use laws. This was not because Haddon and his colleagues had no interest in such measures. In fact, Haddon endorsed seat belt use laws after research funded by



Motorcycle helmet use was a focus of 1 of the 13 safety standards addressing road users that Haddon issued when he headed the federal highway safety bureau. Such standards were part of the balanced approach that Haddon strongly believed in.

(Road design standards weren't included only because they're administered by a different federal agency.)

One of the federal highway safety standards issued at Haddon's behest required all states to adopt motorcycle helmet use laws. By the early 1970s, all but three states had such laws covering all riders. But then politicians in California (one of the states without laws) challenged this requirement, and the challenge led to the demise of federal standards for state high-

the Institute in 1972 demonstrated the effectiveness of the world's first belt use law in Victoria, Australia. The erosion of effective highway safety programs aimed at road users occurred because state politicians refused to show leadership, not because of Haddon's ideology.

Gladwell correctly points out that in the 1970s many countries followed the lead of Victoria and adopted belt use laws. He then claims that “a similar movement in the United States in the early seventies

stalled...". What movement is he referring to? In the 1970s many states were repealing motorcycle helmet use laws, which were proven to reduce motorcyclist deaths, but there was no movement to pass seat belt use laws as early as the 1970s. Safety advocates including Haddon went on record in support of such laws. The federal government had some incentive grants available to any states that passed such laws. But there was no real movement and no progress toward seat belt use laws until the mid-1980s.

It is absurd to claim that "if [Ralph] Nader had advocated mandatory belt laws they might have carried the day." Does anyone believe politicians who voted to repeal helmet laws would have changed their minds and voted for seat belt laws because Nader asked them to?

Even today, most states have weak belt laws with significant gaps in coverage, minimum penalties, and enforcement only if another traffic violation has been observed. Only a few jurisdictions have good laws and politicians who encourage efforts to get more motorists to buckle up.

The contrast with other countries is obvious. In Canada, for example, belt use exceeds 90 percent in all provinces, a rate achieved by good seat belt use laws together with well-publicized enforcement. In the United States belt use rates range from below 50 percent in North Dakota to about 90 percent in California. Our generally dismal record with respect to belt use — compared with Canada, northern Europe, Australia, and a number of other countries — has nothing to do with a "wrong turn" in U.S. policy. It has to do with the failure of political leadership in many states.

Most highway safety measures that can successfully change road user behavior are implemented at the state level. Since the mid-1970s the federal safety program has been able to do little more than encourage appropriate state action. The balanced program Haddon and others supported in the late 1960s envisaged a much more direct federal role. Setting aside issues of federal versus state responsibilities, the

undeniable fact is that the original federal role would have resulted in more progress in highway safety than has been accomplished.

As to Gladwell's section on seat belts and airbags, he needs a lesson in restraint system performance and design. He claims "that even today it is seat belts, not airbags, that are providing the most impor-



tant new safety advances." He apparently is unaware that belt pretensioners are only possible because they use the same technology as airbags. He doesn't seem to be aware that belt force limiters, which allow belts to "pay out" extra webbing to reduce chest loads also are possible only with airbags. Without airbags, belt force limiters would allow drivers' faces to strike the steering wheels in many crashes. Today all auto manufacturers are designing their seat belts and airbags to work together as a single system to optimize occupant protection in crashes.

"In 1959, Haddon [shown left] and I organized a conference, perhaps the first ever on automobile trauma as a public health issue By the mid-nineteen-sixties, we had an agency with Haddon as its head. The issue had been correctly defined. This is what mattered, not the ups and downs that followed. Fifty years ago, cars didn't have 'crashes.' Drivers had 'accidents.' Haddon did this." — Former U.S. Senator Daniel Patrick Moynihan, letter to *The New Yorker*, July 9, 2001

Finally, Gladwell describes a crash involving Robert Day and others, claiming Day's "best chance" of surviving "would have been to wear his seat belt." Day was in a side impact, during which Gladwell says "the door was driven into him like a sledgehammer." This is a crash circumstance when a belt almost certainly would have provided no benefit. Day would have been much more likely to benefit from a side impact torso airbag and/or

improved side vehicle structure — the kinds of technologies Gladwell dismisses.

I had the privilege of working closely with Bill Haddon longer than perhaps anyone, from 1969 until his premature death in 1985. Gladwell's portrait is a distortion of the man and his views. The article fails to communicate the true scope of the original federal motor vehicle safety standards shepherded by Haddon. In addition, it hopelessly misrepresents the successful history of highway and motor vehicle safety efforts during the last three and half decades of the 20th century.

More conspicuous trucks are less likely to be hit in side or rear, federal study shows

Red and white retroreflective tape has significantly reduced impacts into the sides and rears of truck trailers. A new study from the National Highway Traffic Safety Administration (NHTSA) indicates these treatments are most effective on roadways that are dark and unlighted.

For the study, the Florida Highway Patrol and Pennsylvania State Police collected 1997-99 data on crashes involving tractor-trailers, noting whether or not retroreflective tape had been applied to enhance conspicuity. Crashes were grouped according to whether they might have been prevented by improved conspicuity or whether they couldn't possibly have been affected by the conspicuity treatment. The first group of collisions included, for example, those involving cars striking the sides of truck trailers. The second group of crashes included tractor-trailers that ran off the road or other vehicles crashing into the fronts of truck rigs.

Conspicuity-relevant crashes were compared among trailers with and without retroreflective tape. The researchers analyzed crash results for various conditions including dark-not-lighted, dark-lighted, dawn, dusk, and daylight. The tape is most effective in dark, unlighted conditions.

In Florida, the tape reduced crashes into the rears and sides of trailers by 37 percent in dark-not-lighted conditions, com-

pared with trailers that hadn't been treated with retroreflective tape. In Pennsylvania, the reduction in crashes amounted to 44 percent.

While the original rule applied only to trailers manufactured after December 1, 1993, the conspicuity requirement was extended in 1999 to the entire on-road trailer fleet, effective June 1, 2001. Tractors made after July 1, 1997 also must be treated.

ments to single-unit trucks. There are nearly 5.8 million of them on the road, and a substantial number operate during hours of darkness."

Braver adds that improved rear underride guards also would help prevent injuries. "Retroreflective tape can prevent some crashes into the rears of single-unit trucks. But in the absence of adequate rear underride guards, there's still a major haz-



PHOTO COURTESY 3M

Researchers analyzed the crash involvement of truck rigs with and without reflective treatments in various light conditions (dark-not-lighted, dark-lighted, dawn, dusk, and daylight), finding that retroreflective tape is most effective in dark conditions with no lighting.

But an important gap remains. NHTSA doesn't require treatment for single-unit trucks (as opposed to tractor-trailers), pointing out that the single units are less frequently operated at night and they're involved in fewer fatal crashes — about 25 percent of fatal large truck crashes.

"Still, single-unit trucks are involved in about 45 percent of injury-producing large truck crashes," notes Institute senior researcher Elisa Braver. "The NHTSA study results should prompt the agency to examine whether to extend conspicuity require-

ard to people riding in passenger vehicles that strike the rears of these trucks, many of which sit high off the ground." Improved underride guards were required on trailers in 1998, but they aren't yet required on single-unit trucks.

"The effectiveness of retroreflective tape on heavy trailers" (DOT HS 809 222) by Christina Morgan is available from the National Technical Information Service, Springfield, VA 22161. Or visit the NHTSA website: www.nhtsa.dot.gov/cars/rules/regrev/evaluate/809222.html.

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