Are Seat Belts Enough?

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Knowledge of the principles of crash injury dynamics and the frequency of vehicular facial injuries prompts the question: Is the seat belt adequate? It provides only partial restraint. A shoulder strap-lap belt combination reduces the decelerative load on the car occupant and prevents "secondary collision" with the interior of the car. The car can be "delethalized" by combining these straps with some redesign of the car interior.

ON THE AFTERNOON of May 2, 1961, a 19-year-old girl was brought by ambulance to a local hospital. She recalled her sudden inability to steer her compact car while negotiating a freeway interchange but could not remember the collision with a concrete abutment. She regained consciousness in the ambulance.

Initial examinations showed comminuted, crushing fractures of the middle and lower thirds of the face, amounting to complete separation of the facial skeleton from the brain case. There was no sign of intracranial injury and both eyeballs were unscathed. Her only other injury was a broken right clavicle (*Figure 1*).

On the Austin highway, one evening in August, 1953, a young physician was driving home from his classes at the School of Aviation Medicine, Randolph Air Force Base, Tex. His automobile was struck by an oncoming vehicle and he was killed instantly.

FIGURE 1. *Comminuted, crushing fractures of the middle and lower thirds of the face. The eyes were unhurt. The only other injury was the fracture of a clavicle.*

This young physician had occupied the classroom seat just in front of mine in the primary course in aviation medicine. It was through his empty chair that I viewed the incredibly simple and effective techniques used to reduce the extent of crash injuries, described by a great authority on man in motion, Col. John P. Stapp, widely known for his pioneering work with the rocket sled. The principles of crash injury dynamics which were impressed upon my suddenly receptive mind bring the same nagging question with each new vehicular facial injury case: Is the seat belt really adequate in the prevention of trauma?

The Principle of Restraint

Recently I visited a local auto-wrecking yard to inspect the sports car in which two young women had been driving—one of them a student nurse. The dried blood on the steering wheel attested to the fractured maxilla suffered by the driver. The deep pits gouged into the right-hand dashboard gave evidence of the force with which my other patient parted with most of her front teeth and fractured her maxilla as well. Seat belts, dusty from disuse, lay under each seat.

The car had collided with the rear of another

and was not seriously damaged. Neither occupant had any injuries other than to her face. Admittedly, seat belts would perhaps have only modified the injuries, but simple shoulder restraints would have entirely prevented injuries in this instance.

Volumes could be written on the subject of the dynamics of automotive physical trauma. An excellent book is already available. Only the principles will be touched upon here; their application will be left to the reader.

The principle of restraint is illustrated by the standard lap belt. Indeed, its chief raison d'être in the minds of the motoring public is to prevent ejection from the car in a crash. In this it is highly successful, and reliable estimates tell us that simply restraining ourselves with a seat belt diminishes our chances of being killed in an auto crash by a factor of five.

Packaging

A step upward in the direction of survival, however, is made possible by the principle of packaging. The shoulder strap-lap belt combination is the most practical type of packaging for the occupant of a moving vehicle (*Figure 2*). By means of this harness, one permits the automobile itself to absorb much of the destructive energies generated in a crash. Further, the cushioning effect of the harness supplements that of the deforming auto body and reduces the decelerative loads applied to the human. Finally,

FIGURE 2. *Civilian automobile equipped with military surplus harnesses.*

the torso harness prevents the "secondary collision," the term applied to the collision of the human occupant with the interior of the car, so well illustrated by our young student nurse.

The usefulness of this packaging device, the shoulder strap-lap belt, has been demonstrated repeatedly to others as well as myself—chiefly in military air crashes. Happily, certain organizations and even a few rugged individualists have determined for themselves that the potential benefits of this piece of wearing apparel far outweigh the inconvenience of putting it on and taking it off. The Atomic Energy Commission has equipped some of its autos with a single cross-

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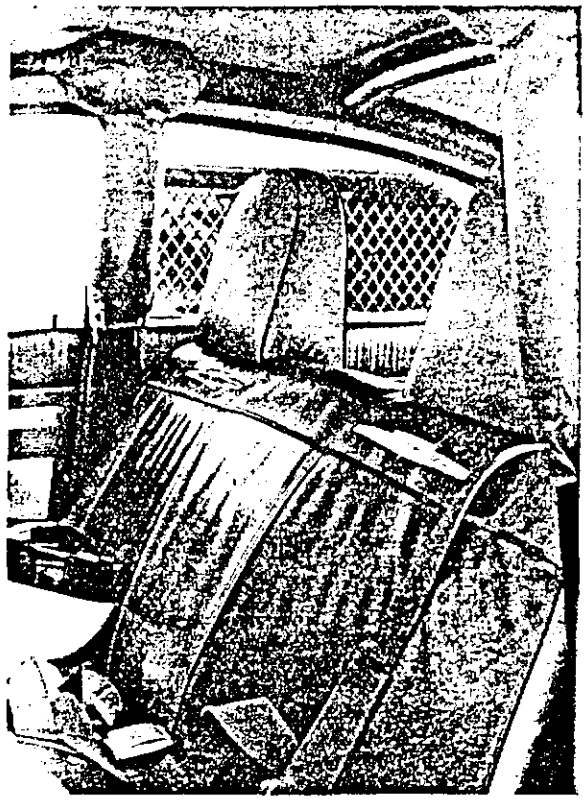

FIGURE 3. *Los Angeles Police Department freeway patrol car; note cross-chest strap, head rests and internal bracing.*

FIGURE 4. *Freeway patrol officer "wearing" his delethalized automobile.*

chest attachment to the lap belt. The Los Angeles Police Department has made this chest strap standard equipment in its freeway patrol cars (*Figure 3*). These freeway patrol autos demonstrate a third principle of injury prevention—delethalization.

Delethalization

Delethalization amounts to redesigning the interior of the package, in this instance the car, eliminating all projections, rigid surfaces and sharp edges likely to cause injury, as well as the addition of interior stiffening members, called roll bars, to prevent collapse of the "packing box" itself. Once securely fastened in his seat, the officer really wears his automobile like a suit of armor (*Figure 4*).

Delethalization is a subject in itself and a fruitful field for those who would reduce automotive injury. It is surprising how effective a one-half inch layer of nonresilient plastic foam can be when used as padding in the passenger compartment.

The shoulder harness has its disadvantages. Like the seat belt, it is a constant reminder that death awaits all of us—perhaps at the next intersection. Secondly, it takes a certain amount of time to fasten and adjust it. Thirdly, it poses a design problem, especially in two-door sedans. Surprisingly, cost is no real deterrent; surplus military belts are available at low cost. These military-type shoulder straps do not increase the likelihood of being trapped in the car, for they are released instantly by undoing the seat belt.

The motorist's own decision to install and wear this type of safety equipment is influenced more strongly by emotion than reason. My attitude was first shaped by the loss of a classmate whose life might have been saved by a seat belt. It has been regularly reinforced, however, by experiences in reconstructing faces torn and broken by steering wheels, dashboards and windshields. At this moment, I would no more elect to venture into traffic without a seat belt and shoulder harness than I would make my hospital rounds in pajamas or bathing trunks. It's simply a matter of being dressed properly for the occasion.