

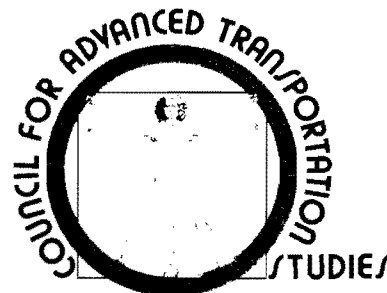
SEAT BELTS: SAFETY IGNORED

GARY D. HALES
ROBERT K. YOUNG
MARTHA S. WILLIAMS

RESEARCH REPORT 52

JUNE 1978

TEXAS OFFICE OF TRAFFIC SAFETY



The University of Texas at Austin

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SEAT BELTS: SAFETY IGNORED

Gary D. Hales
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Research Report 52

June 1978

Prepared by

Council for Advanced Transportation Studies
The University of Texas at Austin
Austin, Texas 78712

For

Texas Office of Traffic Safety
State Department of Highways and Public Transportation
Austin, Texas

The conclusions and opinions expressed in this document are those of the author and do not necessarily represent those of the State of Texas, the Texas Office of Traffic Safety, State Department of Highways and Public Transportation or any political subdivision of the State or Federal Government.

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle SEAT BELTS: SAFETY IGNORED		5. Report Date June 1978	6. Performing Organization Code
		8. Performing Organization Report No. RR-52	
7. Author(s) Gary D. Hales, Robert K. Young, and Martha S. Williams		10. Work Unit No. (TRAIS)	
9. Performing Organization Name and Address Council for Advanced Transportation Studies The University of Texas at Austin Austin, Texas 78712		11. Contract or Grant No. (77) 7200-02 B	
		13. Type of Report and Period Covered Research Report	
12. Sponsoring Agency Name and Address Texas Office of Traffic Safety State Department of Highways and Public Transportation Austin, Texas		14. Sponsoring Agency Code	
		15. Supplementary Notes	
16. Abstract This paper discusses the use and non-use of seat belts and the relevance of such practices to automobile passenger safety. Literature reviewed covers the percentage of current use, psychological and physiological variables, voluntary and compulsory belt use programs, and the effectiveness of seat belts in reducing the severity of injuries and the incidence of automobile fatalities. The authors conclude that while seat belt use could significantly improve automobile safety, the major difficulty is ensuring use; hence the need for information and education campaigns to educate people about the chances of their being involved in an accident and about the efficacy of seat belts in reducing the chances of death and injury from traffic accidents.			
17. Key Words seat belts, compulsory seat belt laws, automotive safety, automotive injury and fatality rates, air bags		18. Distribution Statement This document is available through the Council for Advanced Transportation Studies, The University of Texas at Austin, Austin, Texas 78712.	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 54	22. Price

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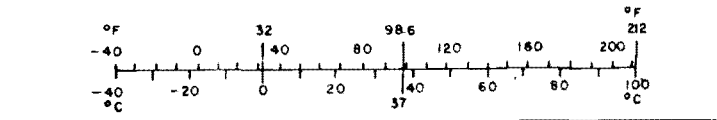
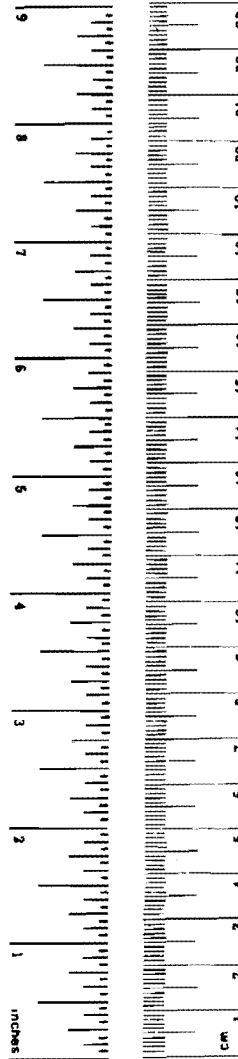
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Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
in ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
VOLUME				
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft ³	cubic feet	0.03	cubic meters	m ³
yd ³	cubic yards	0.76	cubic meters	m ³
TEMPERATURE (exact)				
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
AREA				
cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
km ²	square kilometers	0.4	square miles	mi ²
ha	hectares (10,000 m ²)	2.5	acres	
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m ³	cubic meters	35	cubic feet	ft ³
m ³	cubic meters	1.3	cubic yards	yd ³
TEMPERATURE (exact)				
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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EXECUTIVE SUMMARY

This paper is one of a series being prepared under the auspices of the Texas Office of Traffic Safety. It presents a review of studies dealing with the use of seat belts as a safety device.

The use of seat belts in the United States is currently somewhat low, estimates of use ranging from 14 to 20 percent.¹ Research has shown that seat belt usage is influenced by a number of factors, including time of day and day of week,² age of car, sex of driver or passenger,³ specific conditions of the journey, discomfort or inconvenience, laziness and forgetfulness.⁴ The importance of socio-economic group membership⁵ and injury resulting from a previous accident⁶ is still under investigation. Formal education is related to use,⁷ and specific education regarding the safety of belts may increase use.

The usefulness of seat belts in reducing injuries from accidents is well known and has been cited in many sources. The problem remains, however, that in spite of impressive statistics, we still lack a means of communicating this information to drivers in such a fashion as to increase voluntary belt usage.

¹George A. Beitel, Michael C. Sharp, and William D. Glauz, "Seat Belt Use by Nighttime Drivers," Journal of Safety Research, 6, no. 2 (June 1974), pp. 72-77; and "U.S. Wants Air Bags on 500,000 Cars," Los Angeles Times, 7 December 1976, Part I, p. 21.

²Beitel, Sharp, and Glauz, op. cit.

³Forrest M. Council, "Seat Belts: A Follow-Up Study of Their Use Under Normal Conditions," Journal of Safety Research, 1, no. 3 (September 1969), pp. 127-136.

⁴I.A.R. Galer, The Acceptability of Car Seat Belts, SAE paper no. 770186 (Warrendale, Pennsylvania: Society of Automotive Engineers, n.d.).

⁵Ruth M. Heron, "A Review of Three Studies Attempting to Relate Seat Belt Attitude to Reported Seat Belt Usage," Technical Report no. CR7503 (Ottawa, Ontario: Department of Transport, 1975).

⁶B.J. Campbell, Seat Belt Use Among Drivers in Accidents and Drivers in the Population at Risk (Chapel Hill, North Carolina: University of North Carolina, Highway Safety Research Center, 1969).

⁷Leon S. Robertson, Brian O'Neill, and Charles W. Wixom, "Factors Associated with Observed Safety Belt Use," Journal of Health and Social Behavior, 13 (1972), pp. 18-24.

With a view to discovering measures to increase usage, some studies have examined the variables associated with belt use. From a psychological point of view, the interaction of discomfort felt with the perceived likelihood of an accident (or a "need" situation) is apparently important in determining use.⁸ Attempts to increase usage through use of a "fear approach" may not be effective, however, since people may want to disregard the whole message. One way around the problems of increasing voluntary use is to legislate mandatory use laws. Indications are that the mechanisms exist to implement this approach⁹ and that increased use could have a significant effect in reducing casualties.¹⁰ International seat belt statistics substantiate the claim of saved lives, reduced injuries, and relative ease of implementing compulsory use laws.¹¹

Current alternatives to seat belts are primarily limited to air bags and similar devices. While such devices have potential for saving lives, belts

⁸Gunilla Phaner and Monica Hane, "Seat Belts: Contextual Factors and Bias of Reported Use," Journal of Safety Research, 6, no. 4 (December 1974), pp. 166-170, "Seat Belts: The Importance of Situational Factors," Accident Analysis and Prevention, 5 (1973), pp. 267-285, and "Seat Belts: Relations Between Beliefs, Attitude, and Use," Journal of Applied Psychology, 59, no. 4 (1974), pp. 472-482.

⁹C. Yarbrough, Washington, D.C., Star, 30 July, 1976, D5, p. 27; and Mildred Gnaou, "The Key to Achieving Safety Belt Laws -- Citizen Support," Proceedings of the National Safety Belt Usage Conference, November 28-30, 1973, Washington, D.C. (Washington, D.C.: National Highway Traffic Safety Administration, 1974), p. 16.

¹⁰Charles H. Pulley, "Motor Vehicle Seat Belt Use Laws on the National and International Scene," Proceedings of the Fourth International Congress on Automotive Safety, July 14-16, 1975, San Francisco (Washington, D.C.: National Highway Traffic Safety Administration, 1975), p. 572; and Gregory Taylor, "Australia's Safety Belt Use Laws: Media's Role in Building Support for Belt Laws," Proceedings of the National Safety Belt Usage Conference, November 28-30, 1973, Washington, D.C. (Washington, D.C.: National Highway Traffic Safety Administration, 1974), pp. 43-46.

¹¹Liisa Oranen, Investigation into Use of Safety Belts (Helsinki: Central Organization for Traffic Safety in Finland, 1973); B. Richard, E. Bruhning, and A. Loffelholz, Auswirkungen des Sicherheitsgurtes auf die Folgen der Unfälle im Strassenverkehr ([Bonn]: Bundesanstalt für Strassenwesen, 1976); and William Howard Harsha, "Double Threat to a Killer," Nation's Business, 63 (February 1975), p. 81.

appear to be as effective, if not more effective.¹² The air bags are, however, "passive" restraints and do not rely on auto-occupant compliance.

Based on the findings of current studies, the use of seat belts would unequivocally reduce injury severity and death. The major difficulty in increasing belt use is overcoming the human obstacles of laziness, forgetfulness, and bad habits. In addition, belt design should encourage use. Often, faulty design results in such a struggle that the occupant gives up and lets discomfort and/or inconvenience influence use more than good sense.

¹²U.S., Department of Transportation, A Report on Activities Under the Highway Safety Act of 1966: January 1974-December 1974 (Washington, D.C.: U.S. Department of Transportation, National Highway Traffic Safety Administration, 1975).

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PREFACE

This is the fifth in a series of research reports describing activities and findings on accident research as part of the work conducted by the Council for Advanced Transportation Studies at The University of Texas at Austin under the auspices of the Texas Office of Traffic Safety, State Department of Highways and Public Transportation.

This particular report describes the literature relevant to the use of seat belts as safety devices. A review of the literature in this area is made and conclusions and recommendations of the authors are noted.

ACKNOWLEDGMENTS

The authors wish to gratefully acknowledge the research assistance of Deborah Valentine and Kay Schauer and the secretarial assistance of Helen McGinty and Constance Hill, whose contributions to this report were invaluable. We would also like to commend Del Ervin and Mildred Martin for library assistance and Art Frakes for editorial assistance. We appreciate the efforts and contributions of these talented individuals.

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I. INTRODUCTION

For many years, the commotion raised by those who suggest that seat belt use will save thousands of lives has generally gone unnoticed by the majority of the American people. As early as 1955, there were articles in popular magazines describing how the use of seat belts could prevent injury, both severe and moderate, and possible death.¹ Widespread endorsements of seat belt use and even of mandatory seat belt laws have been made in commercial publications and by official organizations, such as the American Association for Automotive Medicine.²

The Department of Transportation estimates that seat belts are currently being used by about 20 percent of the population and are saving about 3,000 lives annually in this country. The potential saving of lives if usage were increased to 80 percent has been estimated to be as high as 7,000 to 9,000 annually, with a concomitant reduction of major injuries on the order of 65,000 to 120,000 annually.³ Other estimates for potential life saving run as high as 10,000 to 12,000 annually.

It is interesting to note that the Vietnam War, which killed an estimated 56,000 American soldiers, exacted its toll over a period of 12 years, averaging about 4,600 American lives lost annually. This figure is equal to the combined automotive fatalities of Florida and Texas only in 1975. The war generated hundreds of demonstrations and the formation of some national organizations, but no massive public outcry has ever been made about the carnage that occurs every year on the highways, now killing around 40,000 Americans annually.

This report will examine the use of seat belts, how effective they are, and what is being done to encourage their use both in this country and

¹Steven M. Spencer, "How to Avoid Sudden Death," Saturday Evening Post, 228 (June 16, 1955), pp. 26-27, 85-86, 88.

²Texas, Office of Traffic Safety, "Seat Belt Use Endorsed," Texas Traffic Safety Report, 4, no. 8 (1976).

³U.S., Department of Transportation, Traffic Safety 1975: A Digest of Activities of the National Highway Traffic Safety Administration (Washington, D.C.: Department of Transportation, National Highway Traffic Safety Administration, 1975).

internationally. The reader should not expect definitive answers as to why the situation does not change, since at this time no such answers are available. The reader is asked to develop his/her own suggestions. Perhaps you have the answer.

II. SEAT BELT USAGE

Currently seat belt usage is not mandatory in this country and the percentage of people using belts is rather low. While there is some indication that use may be increasing, generalizing from test samples to national populations can give tenuous results due to the possibility of strong situational influences. Scott, Flora and Marsh report on three studies which investigate restraint system usage and indicate a shift in usage percentages from 1973 to 1975.⁴ Their findings are shown in Table 1. While they caution against using this as an index of national usage, which has been estimated at 14⁵ to 20 percent,⁶ a few interesting points are made apparent.

First, there is a noticeable trend toward use of lap and shoulder belts over lap belts alone in 1974 and 1975 cars. Obviously the new restraint system design, which combines both belts into one system, suggests this change. Second, it should also be noted that the usage rate of the lap/shoulder system declined from 1974 to 1975 concurrently with the phasing out of the seat belt-ignition interlock system.

Beitel, Sharp and Glauz report on the frequency of use relative to day/night and days of the week.⁷ Their findings indicate that while there was no significant day versus night change, there were significant differences in use according to day of the week. On Tuesday, Wednesday and Thursday, the average belt use in their sample of 615 observations of use was nine percent. On Friday and Saturday, the average use was 22 percent. This change may reflect a more cautious attitude of drivers during the time when "party-goers" are more likely to be encountered on the road. The difference in claimed use versus observed use was found to be 17.3 percent against 14 percent. It appears

⁴Robert E. Scott, Jairus D. Flora, and Joseph C. Marsh IV, An Evaluation of the 1974 and 1975 Restraint Systems (Ann Arbor, Michigan: University of Michigan, Highway Safety Research Institute, 1976).

⁵George A. Beitel, Michael C. Sharp, and William D. Glauz, "Seat Belt Use by Nighttime Drivers," Journal of Safety Research, 6, no. 2 (June 1974), pp. 72-77.

⁶"U.S. Wants Air Bags on 500,000 Cars," Los Angeles Times, 7 December 1976, Part I, p. 21.

⁷Beitel, Sharp, and Glauz, op. cit.

TABLE 1

RESTRAINT SYSTEM USAGE BY OUTBOARD-FRONT-SEAT OCCUPANTS
WHO WERE CRASH VICTIMS IN 1973-1975 MODEL CARS
OF AMERICAN MANUFACTURE

<u>1973 Model</u>	<u>Range in Three Studies</u>
no restraint	60-70%
lap belt only	26-37%
lap/shoulder belt	3-4%
<u>1974 Model</u>	
no restraint	50-59%
lap belt only	5-8%
lap/shoulder belt	33-45%
<u>1975 Model</u>	
no restraint	58-66%
lap belt only	2-5%
lap/shoulder belt	31-40%

FROM: Robert E. Scott, Jairus D. Flora, and Joseph C. Marsh IV,
An Evaluation of the 1974 and 1975 Restraint Systems (Ann Arbor, Mich.:
University of Michigan, Highway Safety Research Institute, 1976), p. 7,
adapted from table 1.

that people have a tendency to report higher rather than lower usage although the trend is not statistically significant. (The observed usage percentage was generated by having one of the researchers approach the car stopped for observation and look at the driver to see if usage was evidenced. Generally, observation was made of front seat drivers only.) They also indicate that usage was independent of the number of miles driven, which they believe reflects fairly equal driver experience. Finally, they report that only four percent of 65 occupants killed in accidents in Kansas City, Missouri, in 1972 were known to have been wearing belts and/or shoulder harnesses. They conclude that use of a restraint system doubles chances for survival. Tennent agrees.⁸

Council reports usage of from 14 percent to 35.8 percent in new cars equipped with belts.⁹ Higher usage was associated with newness of the car and with the driver's being white, male, older, and from out-of-state. Thirty to 35 percent of those who had shoulder harnesses available used them.

If such a low percentage of drivers is using the belts, the reasons for non-use must be determined if the problem is to be effectively counterattacked. At times, however, it may be difficult even to obtain explanations from drivers as to why they avoid using belts. Waller and Barry suggest that the non-respondents to their survey had poorer driving records and older cars.¹⁰ While this is a supposition, there is the distinct possibility that poor drivers would not willingly respond to a survey which indirectly asks for indications that they are poor drivers. Waller and Barry suggest that from the data collected from those who responded to the survey, it was apparent that failure to remember to wear the restraint device was a major reason given for non-use. Promotional campaigns should consider utilizing the concern that has been expressed regarding seat belt use on long trips to help improve short trip belt wearing habits.

⁸R.B. Tennent, "Death on the Highway: An Analysis of 100 Road Accidents in Rural Areas," New Zealand Medical Journal, 70 (September 1969), pp. 159-61.

⁹Forrest M. Council, "Seat Belts: A Follow-Up Study of Their Use Under Normal Conditions," Journal of Safety Research, 1, no. 3 (Sept. 1969), pp. 127-136.

¹⁰Patricia F. Waller and Patricia Z. Barry, Seat Belts: A Comparison of Observed and Reported Use (Chapel Hill, North Carolina: University of North Carolina, Highway Safety Research Center, 1969).

Campbell suggests that since accidents are more prevalent among socially and educationally disadvantaged persons and certain age groups, especially younger drivers, such groups should be targeted for seat belt promotion.¹¹ (Waller and Barry, also, postulate some socio-economic status differences when they suggest that their non-respondents might be from the economically lower class.¹²) Campbell found that regular use of restraint systems was not practiced even among those who had been in accidents.

Furthermore, Galer found that the reasons for non-use centered on three areas.¹³ First, there were the specific conditions of the journey, the environment, the vehicle and the person. Second, any discomfort or inconvenience due to poor belt fit, adjustment, fastening and stowage lessened the probability of usage. Finally, there was evidence to support Campbell that laziness and forgetfulness were also factors in non-use. Galer was able, on the basis of his work, to divide the users as shown in Table 2. Ideally the belt/restraint systems should be simple, objectively safe, reliable in design and use, inexpensive, and usable by the whole vehicle user population. He concludes that safe restraint systems are a matter of design improvements, campaigns directed to encourage use in particular situations (although generalization is doubtful), further development of passive restraints, interlock/reminder systems, and especially compulsory belt use legislation. This last point, legislation, is so important that he suggests that, as long as belt use is voluntary, it will not be at or near 100 percent.

Heron adds further support to the above discussed factors influencing belt use.¹⁴ The presence of a warning system, a good seat belt design and

¹¹B.J. Campbell, Seat Belt Use Among Drivers in Accidents and Drivers in the Population at Risk (Chapel Hill, North Carolina: University of North Carolina, Highway Safety Research Center, 1969).

¹²Waller and Barry, op. cit.

¹³I.A.R. Galer, The Acceptability of Car Seat Belts, SAE paper no. 770186 (Warrendale, Pennsylvania: Society of Automotive Engineers, n.d.).

¹⁴Ruth M. Heron, "A Review of Three Studies Attempting to Relate Seat Belt Attitude to Reported Seat Belt Usage," Technical Report no. CR7503 (Ottawa, Ontario: Department of Transport, 1975).

TABLE 2

CLASSIFICATION OF SEAT BELT USERS/NON-USERS

Regular User - an individual who (a) is motivated more by general custom of belt use than by transient conditions, (b) holds a pro-seat belt attitude, (c) is not currently subjected to sufficient discomfort or inconvenience by her/his seat belt to interfere with her/his tendency to use it, and/or (d) because the foregoing combination of factors has repeatedly facilitated belt use, has developed a habit of belt use which overrides the effects of laziness and forgetfulness.

Intermittent User - an individual who (a) is motivated more by transient conditions than by general factors, (b) holds a pro-seat belt attitude, (c) may or may not experience discomfort or inconvenience from seat belts, and/or (d) because of a history of intermittency of use, does not have a strong usage habit and is therefore subject to the effects of laziness and forgetfulness.

Regular Non-User - an individual who (a) is motivated by general factors rather than transient conditions, (b) holds an anti-seat belt attitude based on fear or a rejection of the safety value of seat belts, (c) protests about the discomfort or inconvenience of seat belts, and/or (d) because of no habit of seat belt wearing and no desire to establish such a habit, never thinks about them anyway.

FROM: I.A.R. Galer, The Acceptability of Car Seat Belts, SAE paper no. 770186 (Warrendale, Pennsylvania: Society of Automotive Engineers, n.d.).

higher educational/occupational status are associated with greater use. Also connected to more frequent "buckling up" are ownership of late model cars, which are more likely to have seat belts, attendance at driving schools, which often encourage belt use, and the tendency to derive information concerning seat belts from driving school material and newspapers. The driver of lower socio-economic status is discouraged from belt use since he/she is more likely to drive an older car, i.e., one equipped with uncomfortable seat belts, if any. Such drivers are also less likely to be exposed to seat belt information. Additional evidence suggests that the person who uses a seat belt is more safety and risk conscious whereas the non-user is more concerned about discomfort and ineffectiveness of belts. Heron concludes that most people would increase their belt use if a compulsory belt use law were passed; only about 14 to 15 percent of her sample opposed such a law.

Robertson, O'Neill and Wixom also found that education, comfort of belt and convenience were related to higher belt use.¹⁵ In addition, they found that having had a friend injured in an automobile mishap and not smoking while driving were related to belt use. It is intriguing to note that, while personal injury was not related to belt use, injury of someone else was.¹⁶

Swearingen's findings for pilots were similar in that comfort, neatness of appearance and ease of stowage of belts were related to use.¹⁷ In addition, respondents also indicated that ease of donning and escape were important. This is of concern not only to pilots but to many drivers, who indicate that one reason for non-use is fear of entrapment. However, it is probable that being thrown free of the car may be more hazardous than remaining in the vehicle.

In a study especially pertinent to parents, Neumann, Neumann, Cockrell, and Banani found that the children most likely to be wearing appropriate devices were over six months of age and born to United States born parents who

¹⁵Leon S. Robertson, Brian O'Neill and Charles W. Wixom, "Factors Associated with Observed Safety Belt Use," Journal of Health and Social Behavior, 13 (1972), pp. 18-24.

¹⁶B.J. Campbell, op. cit.

¹⁷J.J. Swearingen, Acceptance Tests of Upper Torso Restraints (Oklahoma City, Oklahoma: Civil Aeromedical Institute, 1971).

were white, married, had at least 12 years of education and wore belts themselves.¹⁸ In addition, the parents had feelings of control over their own lives. The parents also had many inaccurate beliefs about seat belts in spite of their using them.

In summary, use of seat belts remains low in this country and the neglect of restraint systems is not a simple matter to understand or correct. Such diverse factors as race, education, socio-economic status, and equipment design are all interrelated. Perhaps one of the most interesting findings relates to those psychological factors associated with use -- e.g., feelings of personal control over aspects of one's life and feelings about risk-taking behavior. Any efforts to encourage restraint system use must consider all the different variables that impact the situation. Even if the techniques for public education are excellent, however, any campaign is doomed to failure if the belts are not really as effective as we would have the public believe. Are belts useful? The next section discusses this question in some detail, and the reader is asked to make his/her own decisions.

¹⁸C.G. Neumann, A.K. Neumann, M.E. Cockrell, and S. Banani, "Factors Associated With Child Use of Automobile Restraining Devices: Knowledge, Attitudes, and Practice," American Journal of Diseases of Children, 128 (1974), pp. 469-474.

III. SEAT BELTS -- DO THEY WORK?

The question of how seat belt usage can be increased takes the implicit position that such increased usage is in fact a desired outcome. One might ask, however, how truly desirable such an outcome is. Just how effective are seat belts and are the injuries due to unrestrained travel more severe than those due to restrained travel?

The following quotes typify the consensus of safety professionals and, surprisingly, of people in general, even though they don't wear belts.

The safety literature implies strongly that all that stands in the way of a tripled or quadrupled saving of lives is public lethargy in using lap and shoulder belts.¹⁹

About 30,000 people are killed every year, nearly 100 a day, and two million or so injured in autos. It is believed that universal seat belt use could cut deaths by half or more.²⁰

Still, many people, even those who drive for a living, refuse to buckle up. Atkin reports on questionnaires given to trucking company employees in which the respondent was asked to indicate if he favored belts and why or why not.²¹ Approximately one half of the drivers responded each way. Of those favoring belt use, a primary reason was for protection. Opposition centered around chances of being trapped and also the very real difficulties inherent in making belt use mandatory.

The comment about being trapped often comes up in discussions of belt use. What many people do not seem to consider, however, is that injury from ejection is very likely to be more severe. Huelke states that the leading cause of death in secondary collisions is ejection.²² Secondary collisions

¹⁹Sam Peltzman, "The Effects of Automobile Safety Regulation," Journal of Political Economy, 83, no. 4 (August 1975), p. 718.

²⁰New York Times, 2 August 1976, p. 24.

²¹Dorothy Atkin, "Do Seat Belts Help or Hinder in Trucks?" Fleet Owner, 64, no. 12 (December 1969), pp. 64-66.

²²Donald F. Huelke, "The Second Collision," Traffic Safety, 67, no. 1 (January 1967), pp. 18-21.

are person-object impacts that follow the initial car-object impact. If one survives the initial crash, remaining in the car for a brief period is probably more desirable than being ejected. Cornell Aeronautical Laboratory, now CALSPAN, estimated in 1973 that motorists not wearing safety belts were 30 times more likely to be ejected from an auto and killed.²³ Perhaps what is needed to counteract the "entrapment" fear is practice in rapid seat belt release when one first gets into a car so that the procedure may become automatic. Coupled with this should be design modifications to incorporate quick release features. While quick belt release may not be a design feature on older cars, most late model cars incorporate such safety features. Other findings regarding seat belt usage are as follows.

Council and Hunter found that in single car crashes, lap belted occupants suffered 66 percent fewer injuries in medium speed crashes than persons without belts.²⁴ Lap belted right front occupants in frontal collisions had 37 percent fewer serious or fatal injuries. Of those persons wearing shoulder harnesses, none of the sample of 29 people showed injuries. Council and Hunter's observations of lap belt use indicated that 19.4 percent of the drivers in their sample were lap belt users, as opposed to only 12.3 percent of center front occupants, 14.9 percent of right front seat occupants, and 11.0 percent of rear seat occupants. There was also a difference in use according to sex, but it was not consistent. Males were more likely than females to wear belts if they were driving, but the reverse was true for other seat positions. There was a significant difference between males and females in usage of the shoulder harness: males 6.2 percent, females 3.2 percent.

Regarding the effectiveness of shoulder and lap belts worn together, Charles H. Pulley quotes Douglas Toms, former Director of the National Highway Safety Bureau, as reporting that no fatal injuries have been recorded at crash speeds of up to 60 miles per hour to occupants who were wearing such restraints

²³"Seat Belts: The Australian Experience," Journal of American Insurance, 49, no. 1 (Spring 1973), p. 31.

²⁴Forrest M. Council and William W. Hunter, Seat Belt Usage and Benefits in North Carolina Accidents (Chapel Hill, North Carolina: University of North Carolina, Highway Safety Research Center, 1974).

as were then approved by federal standards.²⁵ It should be noted that, according to Kreml, approximately 75 percent of fatal crashes occur at speeds of less than 60 miles per hour.²⁶

An Ohio Turnpike Commission study supports the usage of belts, also, even though the claim of no fatalities is not made.²⁷ In their study, they recorded one fatality out of 969 vehicle crashes where belts were used, or .1 percent. In 1,358 crashes where belts were not worn, the rate was 28 fatalities, or 2 percent. The chances of injury without seat belts were about 20 times as great. In more generalized studies, the relative risk of injury has been shown to be 4.06 times greater for non-belt users and about 1.95 times as great for fatal or severe injuries.²⁸ The advantage shown above is for routes where speed limits were from 41 to 60 miles per hour.

In another study of critical-to-life injuries and fatalities, the injury and fatality rate was less in frontal collisions and rollover collisions when belts were used.²⁹ In addition to increasing the chances of escape from injury and death, belts were found to reduce severe to fatal head injuries, eliminate neck injuries to a great extent, reduce the number of the more severe lower extremity injuries, and reduce the number of severe thoracic and abdominal injuries and fatalities.

Another Cornell Aeronautical Laboratory study indicates that failure to use a safety belt increases the risk of instant death and severe injury by

²⁵Charles H. Pulley, "Motor Vehicle Seat Belt Use Laws on the National and International Scene," Proceedings of the Fourth International Congress on Automotive Safety, July 14-16, 1975, San Francisco (Washington, D.C.: National Highway Traffic Safety Administration, 1975), p. 564.

²⁶Franklin M. Kreml, "The Vehicle and Crash Survivability," Analogg [an Allstate Insurance Company publication], no. 11 (1971), pp. 12-19.

²⁷Ohio, Turnpike Commission, Ohio Turnpike Commission Annual Report, 1968 (Columbus: [Ohio Turnpike Commission], 1969).

²⁸Highway Safety Foundation, Preliminary Results of a Study of Seat Belt Restraint Use and Effectiveness in Traffic Accidents (Mansfield, Ohio: Highway Safety Foundation, 1969).

²⁹Donald F. Huelke, Thomas E. Lawson, Robert Scott, and Joseph C. Marsh IV, The Effectiveness of Belt Systems in Frontal and Rollover Crashes, SAE paper no. 770148 (Warrendale, Pennsylvania: Society of Automotive Engineers, n.d.).

nearly 100 percent and of less severe injury by at least 40 percent.³⁰ These figures are within the ranges cited by Frazier, who indicates that a reduction of 35 percent to 80 percent in major or fatal injuries could be made by belt use.³¹ Scott, Flora, and Marsh indicate the effectiveness of lap belt and full (shoulder/lap) restraint systems as shown in Table 3.³²

The percentages given for injury reduction tend to be widely distributed and the claim is consistently made that seat belts will reduce injury. However, is it possible that reducing some injuries causes other injuries? The restraint of a person in a vehicle travelling 55 miles per hour can be the cause of trauma if a sudden stop occurs.

A report by the Automobile Club of Michigan indicates that seat belts prevented some injuries in accidents from being fatal.³³ Seitter and Sharp state that the value of seat belt use in decreasing injury or death in high velocity accidents is not to be questioned in spite of some rare early findings of abdominal injuries caused by belts.³⁴ Rogers, however, states that transverse fractures, caused by the acute flexing of a body over or against an object which acts as a fulcrum, were rarely encountered prior to seat belt use.³⁵

In an extensive study of injuries due to restraint and nonrestraint, Preston and Shortridge found that the injury pattern of an accident is related

³⁰Richard H. Austin, "Death Stalks; Public Officials Talk," Proceedings of the National Safety Belt Usage Conference, November 28-30, 1973, Washington, D.C. (Washington, D.C.: National Highway Traffic Safety Administration, 1974), p. 11.

³¹R.G. Frazier, "Effectiveness of Seat Belts in Preventing Motor Vehicle Injuries," New England Journal of Medicine, 264 (June 15, 1961), pp. 1254-56.

³²Scott, Flora, and Marsh, op. cit., p. 9.

³³Automobile Club of Michigan, Portrait of a Year: A Study of Michigan's 1967 Auto Injuries and Fatalities, Bring 'em Back Alive [series], no. 8 (Detroit: Automobile Club of Michigan, [1968]).

³⁴Major Girard Seitter III and Colonel John H. Sharp, "Seat Belt Injuries: A Review and Report of Four Cases," Military Medicine, 135, no. 3 (March 1970), pp. 215-217.

³⁵L.F. Rogers, "The Roentgenographic Appearance of Transverse or Chance Fractures of the Spine: The Seat Belt Fracture," American Journal of Roentgenology, 3 (Jan.-Feb. 1971), pp. 844-849.

TABLE 3
RESTRAINT SYSTEM COMPARISONS

<u>Comparison</u>	<u>Effectiveness in percent</u>
Lap versus none	26.7
Full versus lap	20.9
Full versus none	42.1

FROM: Robert E. Scott, Jairus D. Flora, and Joseph C. Marsh IV,
An Evaluation of the 1974 and 1975 Restraint Systems (Ann Arbor,
Mich.: University of Michigan, Highway Safety Research Institute,
1976), p. 9, adapted from table 3.

to belt use in a rather subtle way.³⁶ While their results show a general reduction of incidence and severity of overall injury with restraint use, different body areas "respond" to belt use in particular ways. The organs, brain, head and chest show reductions in incidence of injury with belt use; and the neck, shoulders and pelvis show decreases in the severity of injuries. The abdomen, however, evidences an increase in the incidence of injury. It should be considered, though, that belts do not seem to increase the severity of injuries.

There are also special cases of susceptibility to injury, i.e., those of children and pregnant women. Children are best protected by wearing restraint devices appropriate to their ages and sizes.³⁷ In a study of pregnant women, Crosby and Costiloe investigated 441 women who had been victims in automobile accidents.³⁸ Of these victims, 69 had been wearing belts at the time of the accident and 372 had not. (It should be noted that in some cars, the belts will not fit a pregnant woman.) They found no significant differences in maternal or fetal mortality between the two groups. They conclude, however, that since the belt is no disadvantage and since it can prevent ejection, it should be worn. In the case of a pregnant woman, the belt should be secured across the lower pelvis.

Although it appears that belts are effective in reducing the number and severity of injuries, existing belts can probably be improved in both design and function to make their use more convenient and to further reduce the number and severity of injuries. A Cornell Aeronautical Laboratory study states that increased use of seat belts and upper torso restraints (if they are both attractively designed and convenient) should reduce injury in head-on impacts

³⁶F.L. Preston and R.M. Shortridge, "A Study of Restraint Use and Effectiveness," Hit Lab Reports, 3, no. 8 (April 1973), pp. 1-25.

³⁷F.D. Burg, J.M. Douglass, E. Diamond, and A.W. Siegel, "Car Restraint Devices Designed for Children," Modern Medicine, 39, no. 5 (March 1971), pp. 112-114.

³⁸W.M. Crosby and J.P. Costiloe, "The Effect of Lap Belt Restraint on Pregnant Victims of Automobile Collisions," Proceedings of the Fourteenth Annual Conference of the American Association for Automotive Medicine, November 19-20, 1970, Ann Arbor, Michigan (Ann Arbor: University of Michigan, Highway Safety Research Institute, 1971).

and rollovers.³⁹ This finding supports the call for use-design improvement as stated in the preceding section. Le Guen states that existing belts are constructed primarily to restrain the occupant from contact but do little to absorb and dissipate the energy of the impact.⁴⁰ Means and devices to do this include:

- (1) new choices of and processings of belt fibers,
- (2) hydraulic or other dampening devices acting on belt fastening,
- (3) air bags, and
- (4) padding of instrument panels.

Danese suggests that use of a sliding passenger seat to reduce acceleration of the head and thorax would put less load on the seat belt.⁴¹

Another reason for making improvements to increase belt usage and effectiveness is the energy crisis. With gasoline becoming scarcer and more expensive, it is probable that people will turn more often to smaller cars when buying a new or used car. Campbell, O'Neill and Tingley feel that this transition to smaller cars will produce more injuries and fatalities but that belt use can offset this trend somewhat.⁴²

³⁹Cornell Aeronautical Laboratories, Inc., Integrated Seat and Occupant Restraint Performance: Final Report (Buffalo, N.Y.: Cornell Aeronautical Laboratories, 1967).

⁴⁰M.H. Le Guen, "Possibilités d'utilisation des dispositifs absorbeurs d'énergie pour améliorer le fonctionnement des systèmes de retenue des passagers d'un véhicule automobile en cas de chocs frontaux [Utilization possibilities of energy-absorbing devices in order to improve the performance of restraint systems intended for passengers of a motor vehicle in case of frontal impact]," Conference on Road Safety, vol 1: Biomechanics of Accidents (Brussels: Fonds d'Etudes et de Recherches pour la Sécurité Routière, 1968).

⁴¹G. Danese, "A Research Study for an Energy Absorbing Seat Belt," paper presented at the International Technical Conference on Motor Vehicles, London, England, June 4-7, 1974.

⁴²B.J. Campbell, B. O'Neill, and B. Tingley, "Comparative Injuries to Belted and Unbelted Drivers of Sub-Compact, Compact, Intermediate, and Standard Cars," paper presented at the Third International Congress on Automotive Safety, July 15-17, 1974, San Francisco.

In summary, belt use is very closely associated with reduced incidence and severity of injury in almost all cases. Possible savings of life and reduction of injury range from 35 to 80 percent. In spite of all this information, seat belt usage is still quite low. The next section discusses some means that have been tried and some new directions to encourage and/or ensure use of seat belts.

IV. SEAT BELT USE: GETTING THE MESSAGE TO THE PEOPLE

One approach to the whole problem of seat belt usage is to bypass the problem by accepting the fact that the public will not use seat belts and by turning to passive restraint systems. According to Nelson, by about 1983, only 11 percent of the cars will have lap/shoulder type restraint systems; the other 89 percent will utilize passive restraint systems.⁴³ During the transition period, the public may develop a false sense of security and this could result in an increase of injuries and fatalities in accidents. This false security could be the product of a line of thinking that goes, "Well, if the government is making air bags mandatory, then seat belts must be pretty worthless." Thus, there is still a need to increase belt usage during the interim period.

To a questionnaire administered by Raeder and Kuziomko, 2700 responses were obtained from vehicle owners whose cars were equipped with belts.⁴⁴ Non-use was indicated to be due to forgetfulness, inconvenience, and the belief that belts were not necessary in all situations. When asked if they thought that there should be a compulsory use law, 35 percent of the respondents replied "yes" and 34 percent "no."

Fhanér and Hane found that studies based on self-reported seat belt usage indicate a higher percentage of usage than observer studies.⁴⁵ They conducted an experiment to determine the effect of a number of variables on reported use. The variables included: (a) the respondent's perception of the interviewer's knowledge of his/her belt use, (b) the sponsorship of the survey, and (c) the interviewer's sex. They observed, in a sample of Swedish

⁴³W.D. Nelson, "Restraint System Effectiveness," Proceedings of the Fifteenth Annual Conference of the American Association for Automotive Medicine, October 20-23, 1971, Colorado Springs (New York: Society of Automotive Engineers for the American Association for Automotive Medicine, 1972).

⁴⁴P.K. Raeder, Jr., and L. Kuziomko, Attitudes Toward Seat Belts and Shoulder Restraints, Research Report no. 1 ([Albany, N.Y.]: New York State Department of Motor Vehicles, 1968).

⁴⁵Gunilla Fhanér and Monica Hane, "Seat Belts: Contextual Factors and Bias of Reported Use," Journal of Safety Research, 6, no. 4 (December 1974), pp. 166-170.

drivers, no significant differences between groups in the different treatment conditions concerning reported belt use. In conclusion, they assert that response sets influence reported belt use only to a minor degree. This finding also applies to expressed attitudes about belt use.

Fhanér and Hane did investigate situational variables relating to belt use and found that the highest use occurred when other passengers were users and when driving was done at high speed.⁴⁶ They did not, however, find consistency in use between highway and city drivers. Of the drivers studied in their sample, 29 reported behavioral consistency in both situations. Of the other drivers, 34 used belts in the city but none of this group used belts on the highway, and another group reported an opposite trend: 13 in the city, 34 on the highway. Bad visual conditions, the presence of passengers and fast driving were associated with higher belt use by the driver. They emphasize that personality variables interact with situational variables to produce a kind of threshold effect. When a particular person is driving in a particular situation, a certain degree of involvement of variables, such as passenger present, wet or dry road, etc., will lead to belt use. In other words, non-use cues are overcome by use cues and seat belt wearing results.

In further work on seat belts and attitudes toward their use, Fhanér and Hane found that individual differences apparently account for more variance in use than situational differences.⁴⁷ This would seem to support the finding that laziness and forgetfulness play a part in non-use. The individual attitude is a function of strength of the beliefs associated with use and the evaluative aspects of these beliefs. The authors factor analyzed (a statistical technique applied to group information) responses to questionnaires about belt use and generated the following belief patterns influencing belt use:

⁴⁶Gunilla Fhanér and Monica Hane, "Seat Belts: The Importance of Situational Factors," Accident Analysis and Prevention, 5 (1973), pp. 267-285.

⁴⁷Gunilla Fhanér and Monica Hane, "Seat Belts: Relations Between Beliefs, Attitude, and Use," Journal of Applied Psychology, 59, no. 4 (1974), pp. 472-482.

- (1) discomfort,
- (2) worry,
- (3) risk,
- (4) effect (belief that use of seat belt will reduce injuries), and
- (5) inconvenience.

The belief patterns were similar for non-users and users. The instrumentality of seat belts with respect to injuries was conceptualized as a conditional probability, i.e., the probability of an accident times the probability of risk reduction through belt use. The use of belts was therefore influenced by how effective the user believed them to be in a certain situation. If the user believed a situation to be risky and believed also that a belt might reduce the risk, he/she would be more likely to wear it. The best predictors of usage were beliefs, discomfort, and effect.⁴⁸ How much discomfort the individual is willing to put up with combined with a belief about the probable usefulness of a belt in the particular situation heavily influences use. It is interesting to note that while Fhanér and Hane talk of the importance of individual differences, it is still necessary to discuss the effect of situational variables.

Finally, in a review of the literature regarding factors influencing belt use, Fhanér and Hane develop the following list of variables which are associated with increased seat belt use:

- (1) highway driving,
- (2) longer distances,
- (3) higher speeds,
- (4) bad weather,
- (5) higher age (not consistent in all studies),
- (6) higher socio-economic status,
- (7) white (versus black) ethnicity,
- (8) married (versus single) status,
- (9) city (versus rural) dweller, and
- (10) new (versus older) car (some old cars do not have seat belts).⁴⁹

⁴⁸ Ibid., p. 481.

⁴⁹ Gunilla Fhanér and Monica Hane, "Seat Belts: Factors Influencing Their Use -- A Literature Survey," Accident Analysis and Prevention, 5 (1973), pp. 27-43.

The studies conducted also asked people what they thought of safety belt effectiveness in spite of use. Both users and non-users expressed favorable attitudes toward the belts as safety equipment. In addition, a substantial part of the population (42 percent in a Swedish study and a similar proportion in the United States) favored a compulsory use law. Some people opposed such a law while favoring belt use, however. When asked why they drove unrestrained at speeds known to increase chances of injury, the respondents replied with the same reasons cited earlier: forgetfulness, laziness, inconvenience, discomfort, fear of entrapment, disbelief in seat belt ability to reduce injuries, and aesthetics. Fhanér and Hane suggest that perhaps belt use is aversive because putting on the belt may imply that there is truly a risk of having an accident since belts are usually associated with accident situations. This may produce anxiety and cause the person to feel that accident situations are somehow magically caused by belt use. The authors believe that an effective seat belt campaign, if there is such an animal, would need to associate seat belt use with security and good feelings rather than accident statistics.

The Fhanér and Hane literature review also lists the following personality factors as associated with non-use of belts:

- (1) forcefulness,
- (2) vigor in efforts to assert oneself over others,
- (3) withdrawal from contact with others,
- (4) impulsiveness,
- (5) carelessness,
- (6) rigidity (hard time learning new habits), and
- (7) cigarette smoking.

In addition, the person's risk-taking behavior is also useful in determining use. In conclusion, to be effective, a seat belt campaign should allay the anxiety produced by the association with accidents, increase the motivation to wear belts, and reach the threshold level of belt use. One way to do this might be to get the driver to increase the number of situations where he/she considers belt use to be important rather than trying for a global "wear it at all times" campaign.

Beach investigated a similar concept when he compared the effects of high threat and low threat movie themes on belt use.⁵⁰ He found a significant increase in belt use after the subjects had viewed the low threat as opposed to the high threat movies. Butynski tried the use of five different kinds of treatment, from no influence (control group) to persuasive letters and monetary compensation for belt use.⁵¹ While he found that belt use increased in the treatment group versus the control group, and (within the treatment group) in the monetary compensation group the most, no attitude change occurred.

A New York State study concluded that encouraging usage of belts must be based on a clear understanding of driver motives.⁵² As we have seen, however, simply estimating the motives does not lead automatically to a method of attack. Quite often, though, mass media education projects (e.g., public service announcements) have been used in large numbers to reach the public and to encourage use. Fleisher and Pryor found no effect on belt use or attitude after such announcements.⁵³ Naisbitt also studied different approaches to communication of seat belt use information and concluded, similarly to Fhanér and Hane, that, paradoxically, people know the value of seat belts and this is why they don't buy them.⁵⁴ (At the time of his study, belts were optional.) One could surmise that non-use in 1977 could be the result of the same kind of thinking. Ignoring the belts helps dispel some guilt and fear.

⁵⁰R.I. Beach, "The Effect of a 'Fear Arousing' Safety Film on Physiological, Attitudinal, and Behavioral Measures -- A Pilot Study," Traffic Safety Research Review, 10, no. 2 (1966), pp. 53-57.

⁵¹William Butynski, "An Attempt to Measure and Change Drivers' Attitudes and Behaviors Toward Seatbelt Use" (Ph.D. dissertation, University of Vermont and State Agricultural College, 1973).

⁵²New York, State Department of Motor Vehicles, A Pilot Study of Driver Attitudes Toward Seat Belts (Albany, N.Y.: New York State Department of Motor Vehicles, 1963).

⁵³G.A. Fleisher, "A Study of the Effectiveness of a Radio/TV Campaign on Seat Belt Use," Journal of Safety Research, 5, no. 1 (1973), pp. 3-11; and A. Pryor, An Investigation of the Effects of the Oakland County Multi-Media Safety Belt Campaign (Ann Arbor, Michigan: University of Michigan, Highway Safety Research Institute, 1970).

⁵⁴J. Naisbitt, Can Mass Communication Sell Seat Belts? (Washington, D.C.: National Highway Traffic Safety Administration, 1962).

In another study relating to fear, Russell found that seat belts were clearly associated with the level of fear about accidents.⁵⁵ His results suggest that a "fear approach" could possibly increase belt use in those people who are quite concerned with disability resulting from an accident and with fear of the unexpected. Unfortunately, we might infer that the mere installation of the belts may reduce the fear below the threshold level needed to motivate the person to wear the belt.

Bragg also found that attitudes account for a good percentage, 38 percent, of the variance in belt use.⁵⁶ This figure increases to 48 percent when the person considers that an accident is a possibility. This would explain findings suggesting higher belt use in poor weather or at high speeds.

Summarizing, we may say that the person behind the wheel is, in many cases, knowledgeable about the effectiveness of seat belts as a safety device but still avoids use of belts. It is possible that the reason for this avoidance is the association of seat belts with accidents, and, to avoid considering unpleasant thoughts of accident and injury, the person avoids considering the seat belt. This is coupled with feelings of discomfort and inconvenience which are often expressed in many studies. The approach of Fhanér and Hane is to use the discomfort factor and the effect factor to encourage use.⁵⁷ By increasing the effect factor and decreasing the discomfort factor, it should be possible to increase use. Of course the variables influencing effect factors will vary from situation to situation while the discomfort factor will remain relatively constant. Thus, any seat belt campaign which advocates wearing belts at all times may be less efficacious than one which stresses wearing them in certain critical situations -- or at least in those situations which are normally more dangerous. Perhaps in this way the threshold of use can be reached periodically instead of never.

⁵⁵Gordon W. Russell, "Seat Belts, Saints and Fear," Journal of Safety Research, 3, no. 2 (June 1971), pp. 80-85.

⁵⁶B.W.E. Bragg, Seat Belts -- A Good Idea, But Are They Too Much Bother -- An Analysis of the Relationship Between Attitudes Toward Seat Belts and Reported Seat Belt Use (Toronto, Ontario: Toronto University, 1973).

⁵⁷Gunilla Fhanér and Monica Hane, "Seat Belts: Changing Usage by Changing Beliefs," Journal of Applied Psychology, 60, no. 5 (1975), pp. 589-598.

One other method of obtaining public acceptance of seat belts is through legal means. Court cases in this country do not normally consider seat belt use in determining accident liability, although in fourteen states the defendant may seek to prove that the plaintiff was remiss in not wearing his/her belt and thus escaping injury.⁵⁸

Legislative control of safety can take the form of forcing changes in automobile design or establishing compulsory use laws.⁵⁹ Probably the best known example of the latter is the Australian experience with mandatory belt use. This is discussed later, in the section on international approaches to belt use.

Compulsory laws may seem to be a drastic measure but many people approve of the idea.⁶⁰ The fact that most people are law-abiding citizens is given as a reason that most people would wear the belts if the mandatory law were passed.⁶¹ Compliance with belt use regulations in aircraft lends support to this idea.⁶² If 50 percent to 63 percent of the people in Australia favored proposed compulsory seat belt use legislation prior to its enactment, and if about 42 percent of the people in the United States are favorable, and finally if usage here is increased as it was in Australia, as shown by Freedman, Wood,

⁵⁸Edward C. Fisher, "Recent Seat Belt Decisions Reveal Judicial Trend in Civil Cases," Traffic Digest and Review, 16, no. 6 (June 1968), pp. 3-8; and Texas, Office of Traffic Safety, "Safety Belts and the Courts," Texas Traffic Safety Report, 4, no. 11 (1976).

⁵⁹Australia, New South Wales, Traffic Accident Research Unit, Department of Motor Transport, Vehicle Safety and Occupant Protection: Submission to the House of Representatives Select Committee on Road Safety, September 1974 Sydney, New South Wales: Traffic Accident Research Unit, Department of Motor Transport, 1974).

⁶⁰C. Yarbrough, Washington, D.C., Star, 30 July 1976, D5, p. 27.

⁶¹Mildred Gnau, "The Key to Achieving Safety Belt Laws -- Citizen Support," Proceedings of the National Safety Belt Usage Conference, November 28-30, 1973, Washington, D.C. (Washington, D.C.: National Highway Traffic Safety Administration, 1974), p. 16.

⁶²Claude S. Brinegar, "Keynote Address," Proceedings of the National Safety Belt Usage Conference, November 28-30, 1973, Washington, D.C. (Washington, D.C.: National Highway Traffic Safety Administration, 1974), p. 3.

and Henderson,⁶³ then seat belt use laws in this country could have a significant effect on reduction of casualties.⁶⁴ (In the Australia study, pre-law usage in 1970 was about 25 percent wearing belts at all times; in 1973, post-law, this figure had increased to 75 percent.)

Enforcement of the laws is sometimes a problem, but Australian officials found their laws easily enforceable.⁶⁵ One means to increase ease of enforcement would be the use of external signal lights that would inform officers of the occupant's belt wearing behavior. Any such mechanical device would need to be made untamperable, so it would seem that getting favorable acceptance of the law prior to its adoption and getting post passage compliance would still require attitude change and hope for law-abiding citizens to continue such behavior. Considering the problems associated with enforcing the present 55 mile per hour speed limit, there is reason for pessimism.

Since obtaining voluntary seat belt use compliance is very difficult, the option of compulsory law is becoming more viable. Attitudes seem to be not overwhelmingly opposed and perhaps pliable. There are also adequate precedents to dispel the idea that such laws are unconstitutional.⁶⁶ In the next chapter the international experience is presented. With the difficulty of deciding why people do not wear belts, devising effective countermeasures appears very difficult. Circumventing this problem through compulsory use laws would appear to be a matter for consideration.

⁶³K. Freedman, R. Wood, and M. Henderson, Compulsory Seat Belts: A Survey of Public Reaction and Stated Usage (Sydney, New South Wales, Australia: Traffic Accident Research Unit, Department of Motor Transport, 1974).

⁶⁴Pulley, op. cit., p. 572; and Gregory Taylor, "Australia's Safety Belt Use Laws: Media's Role in Building Support for Belt Laws," Proceedings of the National Safety Belt Usage Conference, November 28-30, 1973, Washington, D.C. (Washington, D.C.: National Highway Traffic Safety Administration, 1974), pp. 41-48.

⁶⁵Pulley, op. cit., p. 567.

⁶⁶Brinegar, op. cit., p. 7.

V. INTERNATIONAL BELT USE

Compulsory seat belt usage laws have been more accepted in other countries than in the United States. There are a number of countries with mandatory belt use, and the experiences of a few represent the general trend. Table 4 lists countries having mandatory seat belt use as of January 1977. It should be pointed out that the enforcement practices of these countries differ. Some countries (e.g., Sweden, Denmark, and Switzerland) impose fines, ranging from \$8 to \$100, for failure to use belts. Often, however, the fines are toward the lower end of the scale. Other countries, such as West Germany and Finland, do not have specific fines for noncompliance. If an officer stops a person for not wearing a seat belt, informs the person of the law, and subsequently observes noncompliance, the person can be cited for not obeying the officer. Initial objections of infringement on personal rights, unconstitutionality, and unenforceable aspects of the law have very likely had some effect on attitudes. However, reductions in severe and fatal injuries range from 7 percent in Switzerland (for deaths only) to 46 percent in Sweden. Compliance with the law ranges from 78 percent to 95 percent in the seven countries studied (Switzerland, Denmark, Finland, The Netherlands, West Germany, France, and Norway). The authors of the study, Johannessen and Pulley, conclude:

- (1) there is a need for penalties to encourage observance,
- (2) citation for "failure to obey an officer" is one way to enforce the law if specific penalties do not exist, and
- (3) the compliance laws can be effective if preceded by public education and supported by penalties and conscientious public enforcement.⁶⁷

Pre-law belt use rates were quite low, as evidenced in studies by Oranen, who found city use in Finland at from 4 to 6 percent and total use from 7 to 28 percent, depending on road conditions.⁶⁸ The highest use in a particular situation was 60 percent on long trips and when driving at high speeds.

⁶⁷H. George Johannessen and Charles H. Pulley, Safety Belt Use Laws in Europe: A Positive Initiative for Saving Lives, SAE paper no. 770152 (Warrendale, Pennsylvania: Society of Automotive Engineers, 1977).

⁶⁸Liisa Oranen, Investigation into Use of Safety Belts (Helsinki: Central Organization for Traffic Safety in Finland, 1973).

TABLE 4

COUNTRIES AND JURISDICTIONS MANDATING SAFETY BELT USE

<u>Country</u>	<u>Date Effective</u>
Australia	January 1, 1972
New Zealand	June 1, 1972
France	July 1, 1973
Czechoslovakia	January 1, 1974
Puerto Rico	January 1, 1974
Sweden	January 1, 1975
Spain	April 22, 1975
Belgium	June 1, 1975
Luxembourg	June 1, 1975
Finland	July 1, 1975
Israel	July 1, 1975
The Netherlands	September 1, 1975
Norway	September 1, 1975
Denmark	January 1, 1976
The Soviet Union	January 1, 1976
Switzerland	January 1, 1976
West Germany	January 1, 1976
Ontario, Canada	January 1, 1976
Austria	July 1, 1976
Quebec, Canada	August 15, 1976
Yugoslavia	January 1, 1977

FROM: H. George Johannessen and Charles H. Pulley, Safety Belt Usage Laws in Europe: A Positive Initiative for Saving Lives, SAE paper no. 770152 (Warrendale, Pennsylvania: Society of Automotive Engineers, 1977).

De Grefte and Paar observed usage rates of 8.5 percent in rural areas of The Netherlands.⁶⁹

In an interesting study of the relationship between belt use and reduction of fatalities in West Germany, Richard, Bruhning, and Loffelholz found decreases of 7 percent in the fatality rate for each 10 percent increase in belt use.⁷⁰ The number of injuries dropped 5 percent with each 10 percent increase in belt use. According to this formula, in a country like the United States, raising belt use to 80 percent could save approximately 16,000 lives. While perfect matching is of course not realistic, this study does support the effectiveness of belts.

A similar ratio was found in the state of Victoria, Australia, after passage of a mandatory use law. An increase of 40 percent in belt use reduced fatalities by 17 percent,⁷¹ and Andreassend found a reduction of casualties of 14 percent in the first six months of the law.⁷² Other sources substantiate this claim of reduction of life loss, including some which make estimates as high as 25 percent.⁷³ Another kind of estimate is provided by Taylor, who states that there have been no reductions in death or maiming of children under six years of age, children under eight being exempt from the law requiring seat belt usage.⁷⁴ Overall, compliance with the law is high;

⁶⁹P.M. De Grefte and H.G. Paar, Safety Belts: Their Fitting and Use -- Enquiry 1968/1969 Among Road Users on Roads Outside Built-up Areas ([]: Stichting Wetenschappelijk Onderzoek Verkeersve, 1970).

⁷⁰B. Richard, E. Bruhning, and A. Loffelholz, Auswirkungen des Sicherheitsgurtes auf die Folgen der Unfälle im Strassenverkehr ([Bonn]: Bundesanstalt für Strassenwesen, 1976).

⁷¹Ibid.

⁷²D.C. Andreassend, The Effects of Compulsory Seat Belt Wearing Legislation in Victoria ([Melbourne]: Victoria Road Safety and Traffic Authority, 1972).

⁷³Pulley, op. cit., p. 561; and William Howard Harsha, "Double Threat to a Killer," Nation's Business, 63 (February 1975), p. 81.

⁷⁴Taylor, op. cit.

estimates are from 70 to 80 percent; 80 percent; and 90 percent.⁷⁵ Enforcement has not been as difficult as first imagined and at times the police mount special efforts to detect offenses, particularly during holiday periods.⁷⁶ According to Pulley, the Australian authorities feel that buckling up may have initially been due to fear of arrest, but as time passed, the drivers began to use the belts because of their concern for safety.⁷⁷ Studies in Ontario, Canada, show usage rates of from 60 to 66 percent for rural areas and of 72 percent for urban areas, with a reduction in deaths of 33.6 percent and a decline in injuries of 18.7 percent during the year following passage of the law, as compared to the year preceding passage.⁷⁸ In France, where the law reads that belts must be used in rural areas at all times and in cities from 10 p.m. to 6 a.m., 80 percent usage was reported in 1975.⁷⁹

International experience with seat belt usage has been uniformly positive in the countries examined. When preceded by a public education campaign and backed up by conscientious enforcement, compulsory seat belt use laws appear to have a positive effect on reduction of severe and fatal injuries.

⁷⁵U.S., Department of Transportation, National Highway Traffic Safety Administration, NHTSA Staff Paper (Washington, D.C.: Department of Transportation, National Highway Traffic Safety Administration, 1976), p. 3; Barbara Danahy, "A Device That Saves Lives," Transportation USA, 2, no. 4 (Summer 1976), p. 27; and U.S., Department of Transportation, The National Highway Safety Needs Study, by J.E. Lema, et al., prepared by Research Triangle Institute (Washington, D.C.: Department of Transportation, 1976), p. 253.

⁷⁶Pulley, op. cit., p. 567, quoting Roy M. Lane, Assistant Commissioner (Traffic), New South Wales (Australia) Police.

⁷⁷Ibid., p. 568.

⁷⁸U.S., Department of Transportation, Office of the Secretary, "Motor Vehicle Occupant Crash Protection: Notice of Proposed Rulemaking and Public Hearing," Federal Register, 41, no. 115, 14 June 1976, p. 24072; Leon S. Robertson, "Estimates of Motor Vehicle Seat Belt Effectiveness and Use: Implications for Occupant Crash Protection," American Journal of Public Health, 66, no. 9 (September 1976), p. 863; and P.G. Green, "Ontario's Buckle-Up Law is Paying Off," Traffic Safety, 76, no. 7 (July 1976), pp. 8-11, 34-35.

⁷⁹U.S., Department of Transportation, The National Highway Safety Needs Study, op. cit., p. 254.

VI. ALTERNATIVES TO SEAT BELT USE

Assuming that voluntary seat belt use is not a practical hope either at this time or at all, other means to encourage use or to ensure safety have been suggested. The compulsory belt use laws discussed in Chapters IV and V are one alternative to voluntary use; interlock systems and air bags are two others.

The history of interlock systems has been brief; the system was in fact used only in 1974 model cars. A Department of Transportation study stated that belt use had an immediate potential of saving between 10,000 and 12,000 lives and that the defeat of the interlock systems was due to discomfort and inconvenience.⁸⁰ During the early months the system was in operation, belt use rose more than 50 percent in 1974 models from less than 25 percent in earlier models.⁸¹ Subsequently, usage of belts in cars possessing the system declined by 35 percent over a nine month period, due to system malfunctions as the cars grew older and to discomfort and initial psychological opposition to wearing the belt.⁸² These two latter conditions encouraged disconnection or circumvention of the system. Thus, in spite of some research indicating that drivers would use such a system, it was abandoned.⁸³ Peltzman cites preliminary evidence that had the system remained in use, it alone could have

⁸⁰U.S., Department of Transportation, National Highway Traffic Safety Administration, A Report on Activities Under the Highway Safety Act of 1966: January 1974-December 1974 (Washington, D.C.: Department of Transportation, National Highway Traffic Safety Administration, 1975).

⁸¹Vincent L. Tofany, "Now More Than Ever We Need Buckle-Up Laws," Traffic Safety, 75, no. 1 (January 1975), p. 23.

⁸²A. Westenfeld, A. Phillips, and B.M. Phillips, Safety Belt Interlock System, Usage Survey: Final Report (Princeton, N.J.: Opinion Research Corporation, 1975).

⁸³M. Perel and P.N. Ziegler, An Evaluation of a Safety Belt Interlock System Leader (Washington, D.C.: National Highway Traffic Safety Administration, 1971).

reduced the death rate by about 20 percent.⁸⁴ The interlock system did apparently increase use for a short time, but the annoyance of having the belt control starting of the car was considered extreme by many people and thus the system was discarded.

Much discussion has been generated by the advent of air bags (passive restraint) as a new safety feature. Currently legislative hearings are being conducted to determine the effectiveness of such bags and the feasibility of their mandatory use in new cars. Such legislation will probably have been either enacted or disapproved by the time the reader examines this report. Consider the current state of affairs in light of the following information and try to determine if the right decisions have been made.

A study by O'Day and Morgan found that in Denver, 17.25 percent of the accidents in 1969 were severe enough to have deployed air bags, if the vehicles had been equipped with them.⁸⁵ The percentage in a study of Ohio Turnpike accidents was 63 percent over a four year period. The seriousness of highway accidents versus urban accidents is apparent. The authors suggest some positive effects of air bags and indicate the need for a larger data base from which to make decisions. Fred Secrest, of Ford Motor Company, states that air bags alone do not provide as much potential for saving lives as air bags and seat belts worn together.⁸⁶ Herbert Misch, of the Environmental and Safety Division of Ford Motor Company, goes further and indicates that mandating air bags could be counterproductive and would hinder seat belt promotion since such action could be misinterpreted as saying that seat belted occupants are not well protected.⁸⁷ In addition, there are many modes of crashes in which

⁸⁴Peltzman, op. cit.

⁸⁵James O'Day and Kermit L. Morgan, "The First Thousand Airbags," Hit Lab Reports, 2, no. 7 (March 1972), pp. 6-7.

⁸⁶U.S., Congress, Senate, Commerce Committee, Air Bag Development and Technology, Hearing, 93rd Cong., 1st sess., August 1, 1973, p. 43.

⁸⁷U.S., Department of Transportation, Motor Vehicle Occupant Crash Protection, Public Hearing, August 3, 1976, pp. 68-69.

the person could be ejected from the car, such as rollovers, in which air bag effectiveness is questionable.⁸⁸ It is possible that air bags could prevent ejection if they stayed inflated long enough and with enough pressure to keep the person in place, but seat belts would seem, on the face of it, to be more effective for this purpose.

Finally, conclusions by General Motors, cited by Rosenfield, are that mandatory seat belt usage of 80 percent would save as many as twice the number of lives by 1989 as air bags alone on the driver's side.⁸⁹ A similar use percentage, 70 percent, would save about 10,000 lives annually and air bags would not be needed, according to the Department of Transportation.⁹⁰ It should be pointed out that automotive manufacturers and their representatives, such as Secrest and Misch, may be trying to avoid air bag installation because such a procedure would be unpopular and would raise new car prices. Some studies do lend support to their position, however, if not to their possible rationale.

Alternatives to seat belts will be sought, to what avail only time and further data collection will tell. At this time, however, it is apparent that many people think that seat belt use is the only alternative to killing 40,000 people a year on the highway.

⁸⁸U.S., Congress, Senate, Commerce Committee, Auto Safety Oversight, Hearings, 92nd Cong., 2nd sess., July 19-25, 1972, p. 63, testimony by Charles H. Pulley; and U.S., Congress, Senate, Commerce Committee, Air Bag Development and Technology, Hearing, testimony by Fred Secrest, op. cit., p. 42.

⁸⁹Harry N. Rosenfield, "News from Capitol Hill" [column], Traffic Safety, 76, no. 5 (May 1976), p. 13.

⁹⁰"U.S. Wants Air Bags on 500,000 Cars," Los Angeles Times, 7 December, 1976, Part I, p. 21.

VII. CONCLUSIONS

This report has cited an impressive number of studies that demonstrate the efficacy of seat belts in preventing death and severe injuries in traffic accidents. We have also seen that even when people are knowledgeable about seat belts, they avoid wearing them most of the time. They are most likely to wear them when they believe the risk of accident is greater, e.g., when driving at high speeds, under poor visual conditions, on weekend nights. Apparently the majority of people in the United States are not convinced that the possibility of their being involved in an accident is great enough to warrant their wearing a seat belt all, or even most, of the time.

In the face of the public's lethargy in using seat belts, it has been the general policy of the U.S. Government and automobile manufacturers to change the technology of life saving devices rather than to try to change people's attitudes and behaviors vis-a-vis seat belts. Thus, since 1955, American cars have been fitted with the lap belt system, the shoulder harness, the interlock system, and, most recently, the "passive restraint" systems, such as automatic belts and air bags. The reasoning behind this technological approach has been, "If people will not voluntarily use a restraint system, we will take the decision out of their hands by putting an automatic restraint system in every car." The reasoning is not faulty, but not fool-proof, either. The fate of the interlock system, i.e., its abandonment after only one year because the public thought it was inconvenient -- even though there was every reason to believe that it would save thousands of lives⁹¹ -- might easily befall any other life saving device, however effective, that is considered to be "inconvenient" by the driving public.

An alternative to the technological approach in trying to overcome people's reluctance to use seat belts is the mandatory seat belt usage law. As we have seen, in the countries and jurisdictions where such laws have been enacted, compliance has been generally high and enforcement not overly difficult. No such laws have been passed in the U.S., however, mainly because of lack of popular support for them.⁹²

⁹¹Peltzman, op. cit.

⁹²Gnau, op. cit., p. 15.

A third alternative is to try to change people's attitudes and behavior regarding seat belts by mass media information and education campaigns. There is a reluctance in this country to invest in this approach because past campaigns have been either inconclusive or ineffective in increasing seat belt usage.⁹³ However, it is possible that past campaigns have been ineffectual mainly because of faulty design: they have usually been of short duration; have mainly used television as a medium, relying largely on 30 or 60 second public service announcements; and have not been supported by other media.⁹⁴ There is reason to believe that a well-designed and continuous education and information campaign on seat belts could positively affect people's behavior.⁹⁵ Furthermore, it is the conclusion of this paper that even if the technological approach continues to be followed in this country, or if at some time in the future mandatory belt usage laws are passed, these two courses must be supported by information and education campaigns, for the following reasons.

A recent law prescribes that by 1983 all new cars of American manufacture must be equipped with automatic ("passive") crash protection devices operating on front seat occupants. One of the devices which will appear in new cars is the air bag. However, as has been pointed out in this report, air bags are not maximally effective in preventing injury and death unless used with seat belts.⁹⁶ Furthermore, air bags will be installed to protect only front

⁹³J.B. Haskins, "Effects of Communication Campaigns: A Review of the Research Evidence," Journal of Safety Research, 1, no. 2 (1969), pp. 58-66; Fleisher, op. cit., p. 11; Leon S. Robertson, et al., "A Controlled Study of the Effect of Television Messages on Safety Belt Use," American Journal of Public Health, 64, no. 11 (November 1974), pp. 1071-1080; Patricia F. Waller, et al., Safety Belts: The Uncollected Dividends. A Manual for Use by State Legislators and State Officials on Techniques to Increase Safety Belt Usage (Chapel Hill, North Carolina: University of North Carolina, Highway Safety Research Center, 1977).

⁹⁴Waller, et al., op. cit., p. 12-1.

⁹⁵Ibid.; Haskins, op. cit., p. 65.

⁹⁶U.S., Congress, Senate, Commerce Committee, Air Bag Development and Technology, Hearing, testimony by Fred Secrest, op. cit.; Robertson, op. cit., p. 863; Waller, et al., op. cit., p. iii; Austin, op. cit., p. 12.

seat occupants, while back seat passengers will have to rely on other safety devices (most likely the optional seat belt). A second of the new passive restraint devices is the passive belt which locks into place automatically when the car door is closed. Again, this system will be required to operate only on front seat occupants, which means that back seat passengers will probably be faced with the option of using an ordinary seat belt. It is probable that the air bag and the passive belt will prove effective in reducing death and injury in traffic accidents, but no matter how effective these devices may be, the American public has the option of putting pressure on Congress and the automotive industry to abandon a restraint system that is felt to be inconvenient (e.g., the interlock system). Thus, there is clearly a need to educate people about the chances of their being involved in an accident (60 percent of all accidents occur on "short trips" near the driver's home⁹⁷) and about the efficacy of a restraint system in protecting their lives and bodies; to convince them that the need for this protection justifies any minor inconvenience associated with using a restraint system; and to point out that the most inexpensive and accessible one now and for the next few years is the seat belt. Even though new cars are being fitted with passive restraint systems, there will be a gap of about 8 to 10 years before the large majority of drivers and passengers are so protected;⁹⁸ in the meantime, 10,000 to 15,000 lives per year could be saved if available seat belts were used.⁹⁹

As for the prospect of compulsory usage laws, there are not likely to be any passed in this country until legislators feel that there is popular support for them, or at least acceptance of them. As of 1973, Congress had approved Federal financial incentives for States passing mandatory use laws, authorizing \$141 million for this purpose, but no State has yet passed such

⁹⁷"Seat Belts: Campaign Case History: Tyne-Tees [G.B.], 23 August- 3 October 1971" [Advertising agents: Masius, Wynne-Williams, Ltd., London, England]. (Mimeo.)

⁹⁸Austin, op. cit., p. 12.

⁹⁹Brinegar, op. cit., p. 2.

a law, mainly because of constituents' opposition to it.¹⁰⁰ Obviously, there will be no popular support for mandatory usage laws until people are convinced, first, of the need to wear seat belts, and, second, of the need to legislate that wearing, and people will not be convinced of these needs until they are educated about the risks of driving anywhere and about the efficacy of seat belts in reducing the chances of death and serious injury by about half.¹⁰¹

It is informative to trace the history of the events leading to the passage of the world's first mandatory seat belt usage law, in the state of Victoria, Australia, in December 1970.¹⁰² A continuous and explicit press campaign over a period of ten years sensitized the public to the carnage occurring on Victoria's highways (the highway death rate had been rising at a rate of 6 percent per year for the previous ten years) and to the human tragedy caused by accidents, not only for the victims but for their families and the society as a whole. Simultaneously, the press campaigned for the enactment of legislation to reduce accidents, including a mandatory seat belt usage law. Media pressure on the Government to pass such a law increased steadily until in November 1970 such legislation was introduced and enacted. "The public accepted the legislation with barely a protest,"¹⁰³ and usage rates, even immediately following passage of the law, were higher than even the most optimistic of supporters had predicted. The total number of those killed and injured on the highways dropped 20 percent almost immediately. It is highly unlikely that such a law would have been passed or that compliance with it would have been so high, with such dramatic results, but for the education and information campaign carried on by the local media. The time was right for the passage of a mandatory usage law because people had been educated about the causes of Victoria's highway death toll and had become convinced that seat belt usage was the fastest and most effective way of lowering it.

¹⁰⁰Gnau, op. cit.

¹⁰¹"Seat Belts: Campaign Case History: Tyne-Tees G.B. , 23 August-3 October 1971," op. cit.

¹⁰²Taylor, op. cit.

¹⁰³Ibid., p. 47.

People in America are already behaving rationally about seat belts in a limited way: they are using them more often in situations where they perceive the risk of accident to be greatest. Surely this behavior could be developed and amplified by educating people about the risk of accident present every time one drives and about the usefulness of seat belts in reducing the risk of injury and death in traffic accidents. Although new and different restraint systems will probably be developed in the future, the fact remains that now and for the next decade, seat belts are the least expensive and most accessible method for the greatest number of people. Used now, they are capable of saving the lives of from 10,000 to 15,000 people in the next year.

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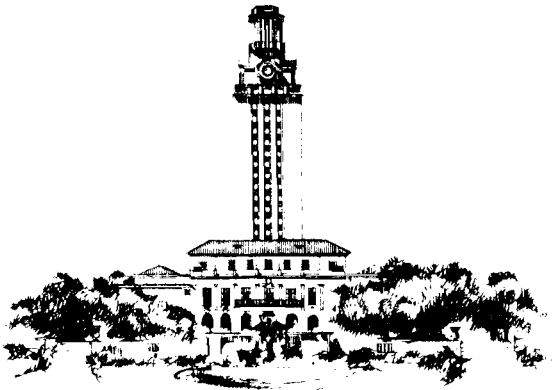
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