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Vehicle Safety Features Aimed at Preventing Alcohol-Related Crashes

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ABSTRACT: This review focuses on the role of motor vehicles in the prevention of alcohol-related fatalities in the United States. Since alcohol significantly affects brain function, it is natural to make drivers the prime targets for impaired-driving–prevention programs. However, the prevalence, design, ease of operation, and safety features of motor vehicles, as well as state regulations of their operation, have an important influence on crash occurrences, particularly those involving alcohol. This review begins with a discussion of why the automobile became the central technological device in the alcohol-related fatality problem and then moves on to an overview of motor vehicle safety programs that have impacted impaired driving. The article then presents an extended discussion of the effectiveness of vehicle-based, alcohol-detecting ignition interlock devices (interlocks), which provided the principal specific vehicle-based effort in the 20th century to separate alcohol consumption from driving. The review ends with a commentary on the issues that will arise in managing operator impairment in autonomous (self-driving) vehicles—the probable principal 21st-century effort to reduce impaired driving and eliminate alcohol-related crashes by minimizing the role of the driver.

KEYWORDS: Alcohol-related crashes, autonomous vehicles, impaired driving, safety vehicles, vehicle confiscation, vehicle impoundment, vehicle interlocks, vehicle licensing, vehicle safety programs.

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INTRODUCTION

Objectives of This Review

It is well understood by safety researchers and policymakers that highway crashes involve three factors: the driver, the vehicle, and the roadway. However, when it comes to the special category of alcohol-related crashes, the driver receives most of the attention. This is logical given that overconsumption of alcohol impairs both cognitive and psychomotor functioning and increases the risk of crashes and injuries on roadways. This review notes the substantial success that has been achieved through laws and programs focused on the drinking driver, which have included a broad range of activities such as educating the public and treating problem drinkers, as well as enacting and enforcing driving-while-impaired (DWI) laws. However, progress in both roadway and automotive technology has also produced substantial safety benefits, some of which are particularly relevant to reducing alcohol-related crashes. Because of the more limited understanding of the role played by the motor vehicle and the roadway, those achievements have not been recognized as contributions to impaired-driving programs. This article attempts to highlight the role of automotive technology and the public policies related to motor vehicle operation on the observed reduction in alcohol-related crashes during the 20th century and the expected impact of vehicle factors in the 21st century.

Automobiles and Alcohol — A Deadly Relationship

The automobile is a complex vehicle that taxes key human capabilities — especially when impaired by alcohol — such as balance, attention (particularly divided attention), vision, coordination, hearing, and judgment. The appearance and rapid growth in numbers of automobiles in the 20th century (e.g., 36 motor vehicle traffic fatalities in 1900, 36,688 in 1955) in the heavy-drinking US culture led to 1.4 million deaths in alcohol-related vehicle crashes during the 20th century [40]. These road-traffic deaths occurred despite the fact that per-capita alcohol consumption did not increase during the same period, suggesting the significance of the automobile in the epidemic of alcohol-related deaths. The private vehicles available in the 19th century involved slow-moving, relatively lightweight conveyances (mainly horsedrawn carriages); the 20th century saw heavy, high-speed cars in the hands of individual owners. The combination of weight and speed in the automobile produced high acceleration loads (*g*) on a vehicle and its driver in the event of a crash.

Although there are many different types of vehicles on the road, the private vehicle became the principal source of the problem. Commercial drivers were subject to many controls not placed on the operator of a family car. In an occupational setting, employers screen applicants to select the most qualified for the job of driving heavy and potentially dangerous modes of transport. Once selected, employees are trained to operate equipment maintained by experts and work under supervisors who are empowered to terminate those who are not performing adequately. Thus, commercial transportation companies have a number of safety features that reduce the impact of an inebriated operator.

The private automobile presents a strong contrast to other industries that use vehicles. It places powerful

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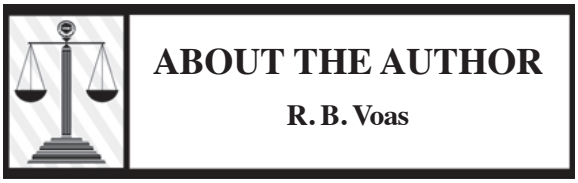

ABOUT THE AUTHOR

R. B. Voas

Robert B. Voas received a Ph.B. degree from the University of Chicago (1946) and B.A., M.A., and Ph.D. degrees in experimental psychology from the University of California (Los Angeles, CA) in 1948, 1951, and 1953, respectively. Dr. Voas is now a retired senior research scientist with the Pacific Institute for Research and Evaluation (PIRE) in Landover, MD.

After serving with the Navy, Dr. Voas was appointed astronaut training officer with the National Aeronautics and Space Administration, and director of selection for the US Peace Corps. Dr. Voas joined the National Highway Traffic Safety Administration (NHTSA) in December of 1968 and became a senior research scientist at the PIRE in 1982.

At NHTSA, Dr. Voas was in charge of driver research, with a first assignment to develop a plan for the implementation of the Alcohol Safety Action Program (ASAP), which involved establishing 35 community alcohol-related safety demonstration projects in localities across the nation. These programs provided an opportunity to test new enforcement techniques: The use of sobriety checkpoints, using passive alcohol sensors, hand-held preliminary breath testers (PBTs), and field sobriety tests. Dr. Voas had a role in the development of each of these program elements, conducting the first evaluations of sobriety checkpoints in Virginia and in California.

Dr. Voas brought the first fuel-cell hand-held PBT unit to the US from Britain and managed the program to get it qualified and approved by the US Bureau of Standards; he imported the first passive breath sensor for police use from Japan and conducted the first US tests with the District of Columbia police. He established the contract program to develop field sobriety tests with Dr. Herb Moskowitz. Dr. Voas established the first contract for a National Roadside Breath Test Survey and conducted the second survey under contract to the Insurance Institute for Highway Safety. As a senior research scientist at the PIRE, Dr. Voas pursued numerous nationwide research programs about college drinking, underage drinking, cross-border drinking, and the application of vehicle interlocks and education and treatment programs for drivers convicted of driving while impaired.

Dr. Voas has served as the president of the International Council on Alcohol, Drugs, and Traffic Safety and an assistant editor for the journal *Addiction*. He has received the Lifetime Achievement Award of the Research Society on Alcoholism; the Widmark Award and the Borkenstein Award from the International Council on Alcohol Drugs and Traffic Safety; the Public Service Award from the National Highway Traffic Safety Administration; the James J. Howard Traffic Safety Trail Blazer Award from the Governor's Highway Safety Association; the Forest Lowery Award and the Ralph Hingson Research in Practice Awards from Mothers Against Drunk Driving; and the Senior Scientist Career Award from the National Institute on Alcohol Abuse and Alcoholism.