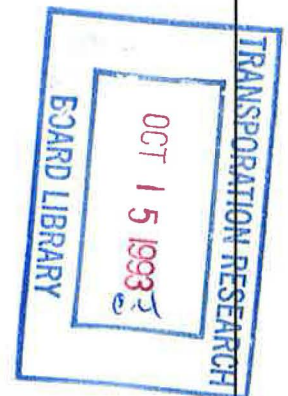


CIRCULAR

Private Vehicle Access for People with Disabilities Policy Issues, Options, Research

Transportation Research Board
National Research Council
2101 Constitution Avenue NW
Washington, D.C. 20418



**WORKSHOP ON
PRIVATE VEHICLE ACCESS FOR PEOPLE WITH DISABILITIES:
POLICY ISSUES, OPTIONS, RESEARCH**

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INTRODUCTION

In June 1988, the Committee on Specialized Transportation of the Transportation Research Board conducted a state-of-research review in the field of transportation for people with disabilities. The review identified a limited number of areas in which insufficient research was being conducted in relation to the mobility needs and preferences of people with disabilities. One such area is public policy and private sector roles in promoting the supply and demand for privately licensed cars and vans. While substantial research has been, and is being conducted with regard to technology and driver education and rehabilitation, virtually no systematic study could be identified on the question of policy.

To establish a consensus on research needs in the area of private vehicle access, the Committee on Specialized Transportation held a targeted workshop designed to identify a framework of key issues and priorities in each area to guide future research. The conference was held May 5-7, 1991, in Detroit, Michigan.

The general workshop strategy adopted by the Committee on Specialized Transportation has four components, as follows:

- Participation limited to active specialists in the field in question;
- Highly targeted program activities structured so as to achieve consensus on specified questions;
- Co-sponsorship by major institutions in related fields and markets; and
- Follow-up publication of results.

The concept of "active specialists" includes consumers and consumer advocates. The purpose of limiting participation to active specialists was to ensure the most credible-possible results and thus maximum impact in the field. The second element of the strategy--highly targeted program activities--is intended to focus the workshop on specific issues that are already known to represent areas of neglect with respect to research and development activities in the field in question. Credibility and impact is once again the premise for recruiting major institutional co-sponsorship. Publication of results is intended to promote and maximize

wide-spread awareness of the results and thus maximize their adoption into research and development agendas.

PARTICIPATION AND CO-SPONSORSHIP

The workshop planning team developed a network of 42 individuals, 35 of whom accepted the invitation to participate in the workshop and 30 of whom actually participated. Participation was recruited from eight distinct fields, as follows:

- Automobile manufacturers;
- Vehicle modification firms and manufacturers of adaptive equipment;
- University-based rehabilitation engineering centers;
- Legal and constitutional specialists;
- Policy analysts from the public sector with a specialization in transportation for people with disabilities;
- The ergonomics research community;
- Providers of public transportation for people with disabilities; and
- Occupational therapists and driving instructors for people with disabilities.

Co-sponsorship was recruited from six fields, as follows:

- Public sector;
- Automobile manufacturing industry and the vehicle modification and adaptive equipment industry;
- For-profit research business;
- Academia; and
- Providers of public transportation.

WORKSHOP PROGRAM AND FOLLOW-UP ACTIVITIES

The workshop structure included three distinct activities:

- A plenary session covering four thematic topics;
- Four concurrent subject-specific break-out sessions, each completing a common program of tasks; and
- A consensus-building plenary on the four subjects covered by individual workshops.

The four plenary themes were selected so as to provide the necessary foundation for policy-related discussions in the break-out sessions. The four themes were:

- The Constitutional, Legislative and Judicial Framework for Policy;
- Public Sector Roles;
- Private Sector Roles; and
- The Users' Perspective.

Each plenary topic was lead by an invited speaker.

The four subjects chosen as the basis for break-out sessions were selected by the Workshop Planning Steering Committee, itself representative of the eight fields listed earlier. An initial list of ten subject-area categories was eventually reduced to four, as follows:

- Legislative and Regulatory Needs;
- Policy Needs and Issues in Driver Assessment, Education and Licensing;
- Policy Issues in Vehicle Design, Equipment Standards and the Driving Environment; and
- Funding Needs and Sources.

Each breakout session was conducted by an invited

facilitator according to a detailed format established in advance of the workshop. The format required each break-out session to address five steps. The purpose of each step was as follows:

- Step 1--To identify key issues and to establish key policy objectives.
- Step 2--To identify policy instruments and options, both public and private, for attaining policy objectives.
- Step 3--To identify research required in support of the achievement of policy objectives and the design of policy instruments.
- Step 4--To rank issues, objectives, policy instruments and research needs in order of importance.

The **fifth step** involved the preparation of a brief presentation of each break-out session's findings for the final plenary session.

SUMMARY OF WORKSHOP FINDINGS

Though overlapping and interdependent, the workshop led to two distinct outcomes. The first is a series of research and development requirements. The second is broad consensus regarding key policy issues and policy development needs. Both are presented below.

TABLE 1 SUMMARY OF POLICY AREAS, KEY ISSUES, AND RESEARCH AND DEVELOPMENT NEEDS

Information, Legislative and Regulatory Needs	No standard method of recalling licenses from people with progressive disabilities	Research and develop methods for evaluation and license recall
	Poor information flow between consumers, suppliers, government	Research and develop methods to facilitate communication
	Lack of regulation of safety standards in the production of adaptive equipment leads to a fragmented industry structure and unsafe practices	Research ways to develop standards by the National Standards Council and regulatory action by the National Highway Traffic Safety Administration
Driver Assessment, Education and Licensing	Insufficient standardization of driving assessment and testing criteria for people with disabilities	Research and develop systematized tests and evaluation methods

TABLE 1 SUMMARY OF POLICY AREAS, KEY ISSUES, AND RESEARCH AND DEVELOPMENT NEEDS

	No Standardized training or course materials for instructors who conduct driver assessments for people with disabilities	Research and develop a standard syllabus and training system
	Driver evaluation and assessment technology has not kept pace with bio-medical and vehicle technology	Research and develop a plan to bring these technologies into balance
Vehicle Design, Adaptive Equipment Standards and the Driving Environment	Insufficient standardization of adaptive equipment and specifications for vehicle modification	Develop standards and specifications
	Lack of disability related design at the concept stage of automobile and van design	Research methods to make vehicle designers aware of people with disabilities as a market for vehicles
	Lack of standardized procedures for testing new products for people with disabilities, e. g., crash dummies do not exist	Develop procedures for testing equipment for people with disabilities
	Incompatibility between adaptive vehicle modification and automotive engineering	Research and develop methods to increase compatibility
	Need for a national emergency network for drivers with disabilities	Research and coordinate a comprehensive national network and identify funding sources
Funding Needs and Sources	Standardized procedures for testing products for drivers with disabilities is not affordable by the private sector alone.	Identify sources of public funds to subsidize testing of new products
	Need to identify methods of subsidizing vehicle and adaptive equipment purchases for people with disabilities	Research and compare mechanisms for subsidy, including tax breaks, low interest loans and rebates

OVERVIEW OF OUTCOMES

A total of thirteen issues stand out as a basis for defining high priority research and development needs to support policy direction to improve private vehicle access and availability. These are summarized in Table 1 and discussed in greater detail below. While the key issues were identified in the workshop, and some research areas were identified, the discussion which follows includes some material added by the authors to provide a more complete treatment of the issues raised. The authors would also like it understood when an absolute assertion is made (such as there is no...), they are reporting on the comments of the experts gathered in the workshop. These assertions have not been reviewed in the light of additional or later information that modify them.

1. There is no standard and scientifically sound (and fair) method of license recall for people with progressive disabilities. Sound, systematic and equitable methods need to be developed. Research is needed to help identify when progressive disabilities are likely to interfere with safe driving, making it advisable to revise license expiration dates or re-evaluation periods. Additionally, accurate and equitable methods of evaluating the deterioration in people's driving skills need to be identified, standardized, and made available to licensing policy makers. (See also item 4 below.)

2. Even though effort has been made by various groups to publish guides and establish databases, information regarding private vehicle transportation for people with disabilities is not available to all concerned parties, including consumers, suppliers, government, and other third party providers.

Research should be conducted to determine what information is missing and what the effects would be if it were more widely available, or more specifically if it were directed to the appropriate recipients. It is possible that such improvements in information can empower consumers to take control of issues related to safety, value, and suitability of equipment they need. It may also lead them to the sources of services and equipment. Additionally, governments, suppliers of equipment and standards-making organizations can benefit from the experience of consumers, suppliers, evaluators and trainers. Research should provide guidance on how to disseminate information effectively.

3. The vehicle modification industry is characterized by thousands of very small suppliers providing goods and services in a largely unregulated market environment. Some analysts believe the absence of regulatory control has led to compromised standards of safety and quality;

they also suspect that the market is overcrowded with producers of inadequate or obsolete equipment. This abundance of small suppliers dilutes the market, not allowing any of the suppliers to earn the resources to modernize and innovate.

Research is needed in order to develop a sound profile of the vehicle modification industry, to document the quality and performance of its services and products and to determine whether regulatory control of some degree is needed. Appropriate agencies to address these areas are the National Standards Council and the National Highway Traffic Safety Administration.

4. There is insufficient standardization of driver assessment testing methods and criteria with regard to people with disabilities. Establishment of such standards require research to determine the most appropriate basis for them, both in terms of techniques and in terms of how specific abilities measured by these techniques reveal the individual's ability to drive. Since a good bit of research has already occurred in this area, a literature search should be the first step, followed by a consolidation of what is known. With this accomplished, the areas of research not yet explored can be identified.

5. There is no standardized training or course material for instructors who conduct assessments of drivers with disabilities. A standard syllabus and training system need to be developed. (This is a natural extension of the work outlined in Item 4 above.)

6. Driver evaluation and assessment technology has not kept pace with bio-medical and vehicle technology. For instance, little has been done to update evaluation methods or criteria for joy-stick control, which has been available for vehicle adaptation for several years. Furthermore, OEM vehicle technological advances (those in production like Anti-lock Brake systems and those under development like Intelligent Vehicle Highway Systems) and medical advances may have powerful implications for the ability of people with disabilities to drive and/or for the safety and value of the equipment offered to assist their driving. However, much of the work in adaptive driving evaluation and assessment is routed in time honored practices and has not incorporated these advances in science and technology.

Research is needed to catalogue potentially useful medical and vehicle advancements (and perhaps supporting technologies, such as voice recognition and virtual reality that have not yet achieved application in these fields) and evaluate the potential of each one in terms of its ability to improve mobility as well as in terms of its economic viability for the developer of the technology.

7. While such standards have been called for by

interested parties for many years, very few standards exist for the equipment used to adapt vehicles for use by people with disabilities. Because adaptive equipment is often funded by third party providers using a competitive bid process, bidders are motivated to reduce the cost of the equipment they intend to provide, in order to win the business. Standards will enable consumers and third party providers to be assured that the equipment meets the specified standards of safety and function.

Several organizations have been involved in the standards setting process, notably the Veterans Administration (VA), the Society of Automotive Engineers (SAE), the International Standards Organization (ISO), the Canadian Standards Association (CSA), the National Mobility Equipment Dealers Association (NMEDA), and RESNA. The VA published standards on wheelchair lifts and hand controls many years ago. These are considered outdated and the VA is supportive of the SAE effort to provide up-to-date standards. The SAE has published a standard on hand controls, and is close to publication of standards on wheelchair lifts (both of these can be used to replace the VA version), and on van structural modification.

Additional work is underway on power assisted controls and wheelchair and occupant restraints. CSA and ISO have also been at work on wheelchair restraints, but their emphasis is primarily on public transit, rather than private licensed vehicle transportation as is the focus of the SAE work. NMEDA is focusing on installation procedures and modification processes, while RESNA has developed a series of standards for wheelchairs themselves and will be a participant in a new development of a standard for a "transportable" wheelchair, one designed to be used as a seat in a moving motor vehicle. The current ongoing work of these organizations will go far toward filling the need for equipment standards, but will not completely finish it.

Many of these standard-setting activities need specific research to guide technical decisions or recommendations for use in the standards. In particular, accident history data would be very useful to those establishing standards.

8. There is a consensus that people with disabilities would benefit if the OEM's were to take their needs into account more in the design of new vehicles. Vehicle manufacturers recently have begun to incorporate improvements aimed at the elderly, in recognition of "the graying of America". Some of these benefits will provide ancillary gains to a portion of the population with disabilities, but this group is perceived by OEM's as being a very small market for vehicles. Several actions are appropriate to encourage the OEM's to consider the needs of people with disabilities in designing vehicles.

These include:

- Establishing the size of the potential market for accessible transportation; and
- Defining features that could be incorporated into EOM vehicles that would benefit the subject population either directly or by facilitating later vehicle modification.

9. There are no standards for testing transportation products for people with disabilities as distinct from standards for the population as a whole. For example, crash dummies (or Anthropometric Test Devices, ATD's) are available only in idealized proportions and in sizes and configurations representing able-bodied males of 50th percentile size and 95th percentile size, and females of 5th percentile size. A few child sizes also exist. These have been bio-mechanically developed and calibrated to respond to crash dynamics more or less in the same way as the humans they represent. The response of (some of) the people with disabilities can vary considerably from the nondisabled models to which the dummies are calibrated, thus use of available ATD's may not provide good insight as to the behavior of some individuals with disabilities in crash dynamics.

On the other hand, people come in all shapes and sizes and it is not practical to test products (either for the disabled or the nondisabled) to norms representing all of these shapes and sizes. The government and automotive industry have settled on a few standard ATD's with the expectation that safety performance improvement for these will extrapolate to safety performance improvement for all people.

Research would be appropriate to determine to what extent the compromise represented by using the existing ATD's to test products for people with disabilities presents a deficiency in the final products offered. If it can be determined that a deficiency does exist, additional research is needed to define the parameters of test devices that would provide more appropriate measurement of these products. Such research must include determination of the responses of humans with the most common disabling conditions, such as spinal cord injury. It would also be useful to provide well-researched projections of the benefit of more sophisticated measurement devices, given the sizes of populations represented, the nature of the products to be tested and the performance that can be expected to be measured in these products.

The above discussion has focused on the crash test ATD's which would be used in testing wheelchair and occupant restraints, etc. Additional test devices and specific norms for people with disabilities may be needed as well, such as those related to control

activation abilities and required forces, etc.

10. Automobiles are designed without due regard for modifications that will be needed at a later time for consumers with disabilities. This makes vehicle modification difficult or expensive. Possibilities include features, such as OEM use of "drive-by-wire" electronic control of throttle and steering, which might allow "plug-in" controllers configured for the specific person's particular need and ability, or use of "flexible manufacturing" techniques that may make niche vehicle production for people with disabilities economically viable.

As well, advanced vehicle design or manufacturing techniques could be tailored to reduce the cost and complexity of such modifications and ultimately eliminate the need for them.

Research is called for to determine what potential advances in automobile design could provide advances in the use of such vehicles by people with disabilities. Also, research could help determine ways to promote utilization of such advanced techniques, and ways to improve the communication between OEM's and adaptive equipment designers.

11. The workshop identified a need for a national emergency aid network for drivers using adapted private vehicle transportation. This nationwide service should be ready to rescue stranded individuals and do repair on specialized vehicle adaption with which the normal automobile service network is unfamiliar and untrained. Research could explore the viability of alternative methods of setting up such an emergency network, identify funding sources, and propose strategies to get it working.

12. The development of equipment and procedures for use in testing products for drivers with disabilities is highly specialized and costly relative to the frequency of use. Direct subsidies are needed to assist the development of standards and conduct the supporting research. Where equipment must be built to test to the established standards, some return may be realized by the owner of the equipment, but it is likely to be small. Public assistance, possibly investment tax credits may make such investment viable. Alternatively, such equipment might best be centralized at public institutions such as universities or the Veterans Administration where use by manufacturers and others could be expected to cover direct costs, but public funding would cover initial investment and some overhead. Research is needed to explore the economics of developing testing equipment and procedures and to provide policy direction.

13. No matter what is done to improve the safety and/or the availability of private vehicles suitable for use

by people with disabilities, the bottom line is that they won't have the use of them if they cannot afford them. Although a significant number of modifications are funded by state agencies, the VA, or insurance companies, few of the base vehicles are funded. Additionally, there remains a significant population that must pay for the modifications personally. Clearly, there are policy implications to the issue of funding, and research is called for to more fully comprehend these issues:

- What portion of the population comprising people with disabilities does not receive any funding (or insufficient funding) for vehicles or vehicle modification? How does funding vary from state to state, and from state to VA to insurance companies to charitable foundations, etc?

- For what portion of the population comprising people with disabilities does insufficient funding prevent access to private transportation? For how many of those is no public transportation available? For how many does the absence or insufficiency of funding preclude otherwise viable education or gainful employment?

- How well do existing funding sources work in terms of providing what is needed? How well understood is the economic return on providing private transportation, in terms of making people self-sufficient, producing members of society?

- Are people falling out of the system when replacement vehicles or equipment are needed, yet are not funded? Or is it common for such people to have sufficient self-generated funds to provide necessary replacement?

- What sources for funding make the most economic sense? How can more funds be made available? What strategies would have the best potential for opening new funding sources?

- What funding mechanisms provide the best human service? What can be done to improve this important aspect of the system?

These and similar research ideas should be able to provide policy makers from the federal, state, and private organizations with facts that may encourage favorable policy development.

Research Versus Action

As this workshop was a project of the Transportation Research Board, there is an obvious and intentional bias toward addressing through research the shortcomings of automobile transportation for people with disabilities. There was, however, an undeniable undercurrent in the

discussions at the workshop to the effect that research itself cannot fix the problems. Policy is the focus of the workshop and it is imperative that research to determine appropriate policy direction be followed by action to formulate policies as directed by the results of that research.

CRITICAL POLICY ISSUES: HUMAN RIGHTS, EQUALIZATION AND MARKET DISTORTIONS

Two policy issues occasioned especially high priority during the consensus plenary session.

The first involved the fundamental basis for policy. The question being--whether principles of civil and human rights should be employed (as in the case of public transport policy) or whether economic and market factors should guide policy development? There was overwhelming agreement that only economic and market factors should govern policy in this area, a consensus that included those who support the use of human rights-based principles as the foundation for public transport (namely transit policy).

A key economic principle established by the workshop is that of "equalization"--a recognition that, due to market distortions, car prices are often disproportionately high for people with disabilities. In particular, the workshop saw a role for policy in minimizing the burden of adaptive equipment costs, vehicle modification costs and higher insurance rates for people with disabilities. Both the public sector and the private sector were seen as appropriate vehicles for helping meet this objective.

Significantly, however, the workshop did not view income supplements or subsidies (other than those used to help equalize insurance costs) as the key to equalization. The second major policy issue stemmed from this finding. The workshop concluded that by elevating prices and stifling innovation, today's fragmented, poorly organized and inefficient production technology for modified vehicles puts auto purchases out of reach for many middle and even high income people with disabilities. Those in need of major vehicle modifications are served through a fragmented split-industry structure, namely the original equipment manufacturers (those who build cars) and the vehicle modification industry (those who tear them apart and re-build them again). Moreover, the vehicle modification industry is itself found to be highly splintered with large numbers of very small firms, none of which can achieve a market share sufficient to support efficient production and adequate research or innovation. This situation was seen to stem in part from the lack of standards and other market controls which in-turn

rewards inefficiency and makes the cost of market entry extremely low. The situation also stems from the failure of public policy to create incentives for the vertical integration of the inefficient split-industry structure.

The workshop thus came to the conclusion that a major research effort is needed on the structure of the vehicle manufacturing industry as it effects the supply of cars and vans for drivers with disabilities. It was hypothesized that the number of existing and potential drivers with disabilities appears to indicate that a potentially profitable market niche can be developed under the right policy framework. At lower prices, achieved through vertical integration and an ergonomically sound niche vehicle design, sufficient numbers of modified vehicle sales could offer auto makers a prospective return on investment that is suitable to justify market entry. Government, however, was seen as the starting point for the background ergonomic and economic research. A first step in that research was conducted by a task force of the TRB Committee on Specialized Transportation, whose findings establish a foundation for policy development.

A MARKET APPROACH TO POLICY: RESEARCH BACKGROUND

Because the average income of people with disabilities is low relative to the population at-large, there is a natural tendency for governments to design programs in support of car ownership by people with disabilities in the form of income supplements or price subsidies. Yet it is also the case that the price of cars designed for people with disabilities is so high in comparison with auto prices in general that even with subsidies in place, the high cost of acquiring an automobile can put ownership out of reach. Indeed, this can be true for high-income people with disabilities.

The question is, why are these car prices so high? Some workshop participants believed that low auto sales to people with disabilities stem not only from low income but also from inefficiency and thus exorbitant pricing in the manufacture of autos suited to their needs. The workshop examined the possibility that low auto ownership among people with disabilities might result from imperfections in market structure as well as lower levels of disposable income (i.e. inadequacies on the "supply side" as well as weakness on the demand side). Although no definitive conclusions were reached, the question itself was considered to be important and worthy of further study.

The advent of robotics and "niche" manufacturing have fostered the discovery of specialized marketing and manufacturing techniques in which products with

innovative or even fanciful design and performance attributes can generate attractive profits despite their appeal to very narrow market segments. However, the workshop found little evidence to suggest that the automobile industry has explored the population of people with disabilities as a prospective niche market. To be sure, various surveys and demographic studies estimate the number of people whose disabilities bear functionally upon the driving task and several engineering and ergonomic studies examine related design and technology issues. These studies do not, however, shed light on the market demand for privately licensed vehicles among people with disabilities, nor does there appear to be any analysis available of the means by which greater demands can be liberated without recourse to income or price subsidies.

If the automobile market does indeed operate sub-optimally in relation to people with disabilities as a market segment (i.e., if efficiency and profits are not being maximized) it might well be because manufacturers are receiving false signals about the true potential of this market to generate favorable sales volumes. False signals would have the pernicious and self-reinforcing effect of inhibiting product development and innovation and thus limit the range of choice and price to which the consumer with disabilities is exposed.

EVIDENCE ON MARKET STRUCTURE

Workshop participants indicated that three characteristics typify the market for cars and vans among people with disabilities:

- Potential demand is relatively small and specialized by virtue of the incidence and unique character of disabling conditions;
- Production is split between auto manufacturers and specialized firms that modify vehicles for use by drivers with disabilities; and
- The vehicle modification industry is characterized by a great many very small firms each limited to a small share of the market.

Automobile manufacturers (the "original equipment manufacturers" or OEMs) do not integrate disability-related vehicle modifications into the standard production process. This appears to reflect the

perception that the market is too small to sustain targeted production models profitably. Product safety engineers in the industry state, for example, that the high cost of specialized safety testing alone is sufficient to dissuade the OEMs from seeking a presence in the market. Consumers with disabilities depend instead upon a separate industry of small, relatively high cost custom modifiers that operate in a largely unregulated environment.

No license is necessary as a basis for entering the custom modification industry and few equipment modification standards or controls exist as a basis for public control. Because of the low cost of market entry, the vehicle modification industry is characterized by a very large number of small firms. Workshop participants estimated that more than 6,000 firms operate in the United States and Canada, most of them employing three people or less.¹ Needless to say, many of these are "basement inventors" who, undeterred by regulatory standards, offer their own brand of high-cost custom modification to one or more consumers with disabilities.

The market structure outlined above raised a number of questions and concerns among workshop participants. In particular, the large number of firms engaged in vehicle modification makes it impossible for even the most long-term oriented companies to invest in the plant and equipment needed to maximize productivity or engage in research and development. This is seen by some workshop participants to prohibit innovation and to sustain high prices for consumers with disabilities. Some participants believe that market regulation would limit entry and allow those who remain to amass the capital needed for investment and innovation. Others wondered whether, in promoting a more concentrated industry, regulation would have the opposite effect by stifling competition and thus worsening the existing situation rather than improving it.

All of this raises the broader question of whether automobile manufacturing is organized in the most efficient way from the perspective of people with disabilities as a market segment. If demand is indeed very small and specialized, a separate vehicle modification industry might well be the efficient market structure. If, on the other hand, low demand is an illusion fostered by the unnecessarily high prices that

¹ Transport Canada, Vehicle Selection Guidelines for Elderly and Disabled People, 1987 (and) Transportation Research Board, Workshop of Privately Licensed Vehicles for People with Disabilities, Detroit, Michigan, May 1991.

stem from an excessively fractured supply chain, vertical integration would promote a more efficient result (i.e., higher profits for OEMs and lower prices for people with disabilities). The answer lies in the true nature of market demand potential in the market comprised of people with disabilities relative to the prices that could be achieved in the most efficient production chain.

EVIDENCE ON NICHE MARKET POTENTIAL

In 1986, Lewis and Smith² developed a functional system for defining "driving-related disability" and used then-available data from the U.S. Health Interview Survey of 1977 to enumerate the numbers of people in North America (U.S. and Canada) whose disability either prevented driving or caused driving problems in various degrees (Figure 1).

Since the Lewis and Smith analysis of 1986, two additional data-bases have become available by which we can gauge market potential. Both are Canadian and both have been used to re-estimate market size. The results are reported in Table 2. We consider the United States and Canada together since the 1991 Free Trade

Agreement will create a unified automobile market within nine years.³

As the statistics in Table 2 reveal, the total market represented an estimated 21 million individuals in 1987, about 10 percent of the total driving-aged population. This percentage is less than the overall incidence of disability (about 14 percent) since it excludes those for whom age, preference or other factors would prevent car ownership.

At 10 percent, the market for automobiles represented by people with disabilities is certainly as large or larger than many other distinct auto markets. The production sports car market in North America and Europe, for example, is certainly no larger than 10 percent. The growing population of older people in the population means, moreover, that the market of people with disabilities is growing more rapidly than the market as a whole.

The estimates in Table 2 also indicate that the market consisting of people with disabilities needs to be viewed as several sub-markets, each of which displays a different set of preferences and needs in the attributes of an automobile.

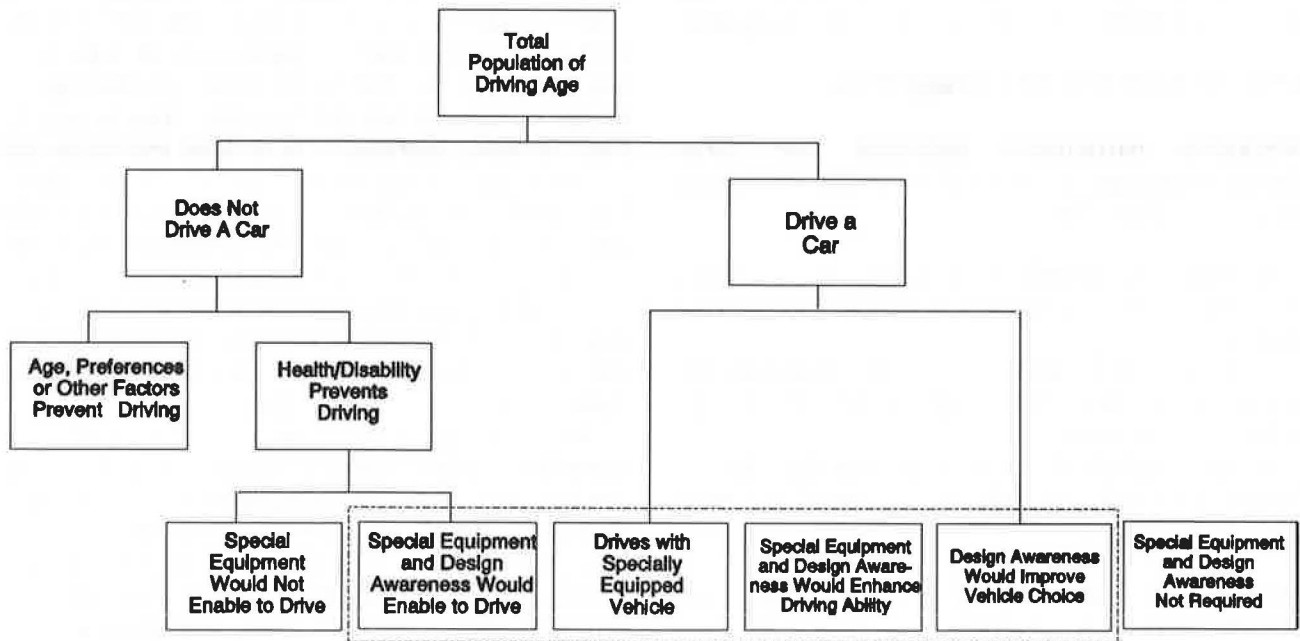


FIGURE 1 Defining the Driving-Handicapped Population.

² David Lewis and Barbara Smith, "Special Driving Needs: Definition and Market Size," *Proceedings of the Fourth International Conference on Mobility and Transport and Elderly and Disabled Persons*, July 21-23, 1986, pp. 662-683

³ Clearly, the formation of major trading zones, including the European Economic Community, creates functionally much larger disability-related auto markets than would otherwise have been the case.

TABLE 2 MARKET SIZE AND MARKET NICHEs
(Number of Persons with Disabilities)

Priority Group	Number of Persons		
	Canada	U.S.	Total
1. Drive Now Without Special Equipment But Would Benefit From Enhanced Design Awareness	1,300,000	12,000,000	13,300,000
2. Drive Now Without Special Equipment But Would Benefit From Such Equipment	410,000	3,820,000	4,230,000
3. Drive Now With Special Equipment	40,000	525,000	565,000
4. Health or Disability Prevents Driving But Special Equipment and Design Would Enable to Drive	296,000	2,815,000	3,111,000
Total Number of Persons with Driving Disabilities	2,046,000	19,160,000	21,206,000

Sources: Canadian Health and Disability Survey of 1986 and Health and Activity Limitative Survey of 1987 (Canada).

As the table shows, over 60 percent of all people with disabilities in the North American automobile market drive without the need for special equipment. An additional 23 percent (some 4.9 million individuals--the sum of rows 2 and 3 in Table 2) represent consumers who drive today, but for whom adaptive equipment is either necessary or beneficial. For many of these individuals, equipment needs are relatively minor and available at low cost (simple hand-controls, for example). Regular production vehicles satisfy most requirements in this market and the major North American OEMs have recognized it as a potentially profitable niche. Attempts to compete for market share include rebates of up to (U.S.) \$1,000.00 and partial payment for adaptive equipment. It is of interest to note that, following the lead of the Chrysler Corporation in August 1990, General Motors, Ford, and Volkswagen of America have

each developed similar programs.

People represented in row 4 of Table 2, and some of those accounted for in row 3--up to some 3.1 million people in the North American market--represent people for whom driving requires major vehicle modifications and adaptive equipment. This is the group for whom demand today is accommodated by the two-industry structure of OEMs and vehicle modifiers. This unintegrated and thus potentially inefficient approach to supply reflects low levels of automobile ownership by people with disabilities. Statistics from the U.S. Health Interview Survey and the Canadian Health and Disability Survey indicate rates of car ownership among people with disabilities that are one-third of the population generally, after controlling for the effects of age. The key issue here however is the fact that there are no market data from which to ascertain whether

efficiency-induced reductions in car prices for people with disabilities would generate higher numbers of buyers with disabilities. Sketchy evidence discussed later indicates, however, that such demand may well be substantial and potentially profitable.

The fact that original equipment manufacturers have yet to enter the market comprised of people with severe disabilities is not in itself a reliable indicator that the market is too small to be commercially viable. The North American market for several niche vehicles (small four-wheel drive sport trucks, for example) is actually smaller than 3.1 million people, indicating that the population of people with severe disabilities may well be large enough to support an appropriately priced product. The Health and Activity Limitation Survey of 1987 indicates that the number of middle income wheelchair users and other users of mobility aids with driving-related disabilities number more than 850,000 -- a number which again exceeds that of many niche car markets.

On the other hand, some analysts believe that the population of people with disabilities, while seemingly large in aggregate, is also highly diverse and heterogeneous in character, thus mitigating its potential as a single niche market. In response to this argument, perhaps it could be countered that many driving-related disabilities could be accommodated by a common design "platform" capable of accommodating the necessary range of alternative modifications (much in the same way that a common computer platform accommodates a huge range of user requirements).

Only further research can resolve these questions. What appears more certain, however, is that true vehicle demand in the "severely disabled niche" cannot be ascertained because supply suffers from poor productivity and inefficient organization which, in turn, prices people with disabilities out of the market. Low productivity and inefficiency appears to have forced extremely high prices indeed. In 1990, a \$10,000 originally-manufactured van can carry a final purchase price to the quadriplegic consumer in excess of \$30,000 after tear-down and modification. Such prices are obviously well beyond the reach of most consumers, both with and without disabilities, regardless of income, and are surely masking the true size of the market.

EVIDENCE ON THE EFFICIENCY OF MARKET ORGANIZATION

This section looks at the productivity of the vehicle modification industry and the efficiency of a split-industry approach to vehicle manufacture for drivers with severe disabilities.

Although formal studies have not been conducted, workshop participants in the vehicle modification business indicated that the industry is highly fragmented and inefficient. The low cost of market entry and minimal controls and equipment standards are believed to have attracted a huge number of firms relative to the overall size of the market. Even the largest adaptive equipment and vehicle modification firms cannot achieve a market share sufficient to support efficient production volumes. Low volumes make it impossible to invest in appropriately sized and automated plant and equipment so as to produce efficiently, nor can even the largest firms afford to engage in sustained research and development activities. According to one prominent manufacturer at the workshop, virtually all firms are in a constant struggle to survive; investment as a means of improving productivity or product quality is often out of the question.

A possible implication here is that some form of regulatory control to facilitate industry concentration might permit greater productivity and more innovation. On the other hand, more concentration raises the fear of oligopolistic practices whereby efficiencies would be taken as higher profits and not passed along to the consumer in the form of lower prices.

Moreover, even an efficient vehicle modification industry might not be the most efficient market solution. Perhaps OEM-made niche vehicles targeted at the market represented by people with severe disabilities would be less costly and more profitable still. Success here would, at a minimum, demand the vertical integration of vehicle modification into mainstream production. There would also need to be a design strategy -- a platform -- that suits a wide range of disability-related needs.

The advent of robotics and other structural improvements in productivity have led a number of OEMs to pursue smaller and smaller niche markets that generate strong returns on investment. As an example, Business Week magazine reports a Japanese manufacturer's production run of 15,000 specially designed cars aimed at the "young, low-paid, female office-worker." The fact that specialized markets can be served profitably suggests that the population of people with severe disabilities, though small and characterized by distinct needs and lower than average incomes, could generate adequate profits.

Here, of course, we enter the realm of speculation. The business decision to pursue a niche market must be predicated upon a firm belief by the manufacturer that the driver with disabilities and their design needs can be treated as a profitable market, free of undue liability and other risks. To date, car makers have not believed this to be so.

Even if the split-industry structure masks a great deal of potential demand by exposing the consumer with disabilities to inefficiency and high prices, OEM costs to ensure a safe product for people with special needs could eliminate theoretical efficiency gains. Thus the evidence on market size, in itself, is unlikely to encourage the OEMs to devote risk-capital to the manufacture of a product line for people with severe disabilities. Joint public-private strategies, on the other hand, could be initiated with the aim of improving

market intelligence, insulating the manufacturer from undue exposure to liability, and leading eventually to vertically integrated production vehicles for people with severe disabilities.

Though very preliminary, the evidence outlined above indicates that people with disabilities may face auto prices that are substantially higher and innovation that is materially lower than the market would yield if it were to be organized efficiently. The workshop concluded that these questions are deserving of serious research.