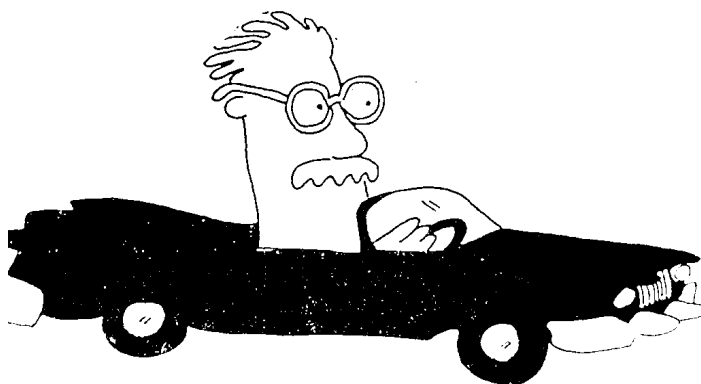


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16. Abstract As all drivers age, limitations in performance as drivers becomes more prevalent. These limitations include visual losses, diminished range of motion, various musculoskeletal disorders. Decrease in ability to timeshare functions has also been noted. Rehabilitation engineering has addressed adaptive equipment from the standpoint of definite physical disabilities and eliminating the handicap arising from such disabilities, but such technology also has application to people who may not be classified as disabled per se, but could use adaptive approaches to minimize the age-related limitations in performance. This Guidebook identifies applicable and practical equipment to improve older driver performance that arises from the automotive adaptive equipment field. Sections of the Guidebook describe adaptive equipment as part of assistive technology, and its application to any older driver. Criteria are given on choosing the right vehicle that is best designed to accommodate the older driver. For new and existing personal vehicles visibility and auditory enhancements are then described. An approach to control adaptation as applicable for relatively undisable but possibly limited older drivers is then discussed, followed by guidelines for selecting equipment to enhance access to the vehicle. The Guidebook concludes with a brief discussion of Intelligent Transportation Systems and their implications for older drivers. Each chapter of the Guidebook contains resources for readers to obtain more product information and technical data.					
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Adaptive Equipment to Enhance Older Driver Performance

A Guidebook



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WHAT IS “ADAPTIVE EQUIPMENT? ”

HOW CAN IT HELP ME DRIVE BETTER AND LONGER?

Some Definitions

You may say, “I may be over 60, but I’m as good as I ever was.” People age at different rates, and not everything associated with aging is bad news. My case to be made here is that everyone has some kind of limitation, and those tend to become worse with age. Let’s consider a few definitions:

Impairment: Any loss or abnormality of psychological, physiological, or anatomical structure or function. Hardly anyone is “perfect.” Most impairments have no significance for driving. Some do.

Disability: Any restriction or lack resulting from an impairment of ability to perform an activity in the manner or within the range considered normal for a human being. If a person is near-sighted (myopia) then objects at a distance appeared blurred, although objects close up can be seen distinctly. The myopia is a disability.

Handicap: A disadvantage for a given individual resulting from an impairment or a disability that limits or prevents the fulfillment of a role that is normal...for that individual. In our society, people are expected to be able to drive themselves, and myopia limits that role because the person can’t clearly see traffic, pedestrians, or signs.

Obviously, a simple device known to the ancient Chinese, and developed in Western culture some time in the Middle Ages, can take the *handicap* of not being able to drive in traffic out of the *disability* of myopia: glasses or contact lenses. The impairment remains; the person is still near-sighted. But the resulting disability and handicap is gone, as long as the person uses the *adaptive equipment* of eyewear—glasses or contacts.

Most of the impairments or disabilities that you and I have are well-compensated for by changes in that way we do things or by use of devices of one kind or another. I have flat feet, so my shoes all have arch supports. Thus I am saved any handicap in walking from my car into a shopping mall. Chances are as the years go by certain abilities important to effective and safe driving become limited. Some of your adjustments to these limitations may be so gradual that you really haven’t noticed them, except that driving seems more of a chore now than it used to be. Hopefully, the suggestions in this guidebook can help you with that. Although this guidebook is addressed to those older drivers who do not have major disabilities such as paraplegia, many to most of the suggestions will also assist older drivers with disabilities.

What is the goal? To keep us driving as long as we can safely do so, because for most people (at least in the USA) there is no question that the personal motor vehicle is the only practical mode of transportation. Although other transportation alternatives certainly exist, they are a last resort for drivers who otherwise would prefer to be buried with their hands on the steering wheel of their cars. In the future, this will probably become an even stronger preference as older drivers can look back on a lifetime of car or truck driving and ownership.

The cohort of drivers who will be 65 in the year 2001, were born in the 1930's. Unlike the subjects of gerontology studies done just a few years ago featuring people who came of driving age in the 1920's or even before, when far fewer people had cars and traffic was sparse, the old of tomorrow started driving in the 1940's and after. We are and will be more affluent, better educated, in better health, resident in the same communities we lived in before becoming "older drivers," and we have driven under modern conditions and the urban environment since our teens. If many older drivers in the past have had problems reading the code of broken vs. solid lines with regard to movement out of the lane, most of us have had driver education and Defensive Driving. We will likely continue driving on a routine basis until almost the end of our natural lives, which will be happening at an ever advancing age. The future older driver may well have much less decline in driving skill where cognitive processes are most important. The perceptual decline outlook is less optimistic, but even there replacement of cataract-scarred crystalline lenses with plastic substitutes is a routine day surgery procedure for ophthalmological surgeons, as is replacement and reshaping of corneas, laser fixation of detached retinas, and much else besides!

So let's be realistic and admit that there are some limitations which are becoming more and more of a bother when it comes to driving, and then see what Assistive Technology has to offer to take any handicap out of those limitations.

Typical Limitations of Older Drivers

Something of a contradiction, because "typical" is a statistical fiction when it comes to the older person. People who work in gerontology say that very wide variability exists among older people with regard to abilities or impairments to those abilities. But the tendency is a downward slope in many abilities as our natural life span runs its course. Let's take a look at some of these trends, so the suggestions made in later parts of the guidebook make more sense.

Changes in Visual Performance

Loss of Visual Acuity (sharpness of vision)

For a variety of reasons, the ability to discern fine detail even with the best optical correction declines with age. Those in their 70's tend to average 20/30, vs. 20/26 for the general population. Older people trend upwards to 20/50 or worse, but many people with such vision drive no longer. States ordinarily do not license drivers with corrected vision worse than 20/40, or if they do restrict them in various ways. Fifteen to 25 per cent of the population 65 and older have 20/50 or worse, owing to "senile macular degeneration," cataract formation, and light scatter in the vitreous of the eye. Although cataracts are routinely removed and replacement corrective lenses implanted, much improving vision, some losses of acuity still occur. Peripheral vision is relatively unaffected, although a gradual narrowing of the visual field from 170 degrees to 140 degrees or less is attributable to anatomical changes (eyes become more sunk in the head). Fortunately, visual acuity among drivers is not highly associated with accident experience and is probably not a very significant factor in discerning path guidance devices and markings. It is, however, significant in reading signs and discerning signals at a distance. Sign standards are minimum standards, designed for drivers who can test 20/23 or better. The same goes for car designers, who tend to make labels on controls and gauges as small as possible, and worse, sometimes with low contrast as well (gray letters on a deep black background). You can see what I mean if you look at



the photo above. A little bit of cataract and no reading glasses, and here's what a panel can look like.

As people age, their ability to discern detail on moving objects (e.g., reading the lettering on a truck side as it crosses your path) declines. This loss in "dynamic visual

acuity” seems to be related to some kinds of accidents, but that relationship is difficult to pin down.

Light Losses and Scattering in Optic Train

There is some evidence that the scotopic (deep night) vision system ages faster than the photopic (twilight/headlights/daylight) system does. In addition, scatter and absorption by the stiff, yellowed, and possibly cataracted crystalline lens of the eye accounts for much less light hitting the degraded retina. The pupil also becomes stiffer with age, and dilates less (senile myosis). There is also more matter in suspension in the vitreous (the jelly-like filling of the eyeball) of the aged eye than exists in the younger eye. The upshot is that only 30 per cent of the light under daytime conditions that gets to the retina in a 20 year old gets to the retina of a 60 year old. This becomes much worse at night (as little as 1/16), and is exacerbated by the scattering effect of the optic train. Points of bright light are surrounded by haloes that effectively obscure less bright objects in their near proximity.

Because of these changes, a given level of contrast of a target in order to detect it has to be increased by a factor of up to nearly 3 in order to restore the visual performance of a 30 year old to an observer age 70, if target area is held constant. This situation improves with the substitution of a lens implant for the yellowed and possibly cataracted crystalline lens, but the operation cannot completely restore the light transmission of youth.

Glare Recovery

A 55 year old person driving at night requires more than 8 times the period of time to recover from glare that a 16-year-old does. An older driver who does not use the strategy to look to the right and shield his or her central vision from oncoming headlamp glare is literally driving blind for many seconds after exposure. As described above, scatter in the optic train make discerning *any* marking or traffic control device difficult to impossible (“veiling glare”), and the slowness with which re-adaptation to the general night driving levels of light occurs is well-documented. Drivers who are particularly impaired with regard to blinding lights avoid driving at night.

Changes in Auditory Performance

Although most of the driving task is visual, there is important roadway and in-vehicle information that is presented by sound. Car and train horns, approaching emergency equipment such as ambulances, railroad crossing signal bells or only a few examples of such information. The click of the turn signal interrupter, warning buzzers or chimes, engine and tire sounds are examples of in-car auditory information that is important. Statistics vary, but about 24% of those age 65 - 74 have some kind of hearing loss that makes it a disability; this percentage rises to 39% for those 75 and older. Most people retain some degree of hearing, and only 4% or less can be classified as “deaf.” For the

minority of older drivers that do have significant hearing loss, there are some adaptive devices that can help.

Changes in Cognitive Performance

As we age, our ability to process a lot of information at once declines. Whereas a teenager (it seems) can do her homework on a computer, watch a TV soap opera, and talk on the telephone all at the same time, older people tend to try and limit how much is coming in. If traffic gets heavy, we tend to turn down or shut off the stereo, interrupt a conversation with a vehicle occupant (or someone on the cell phone!), so as to concentrate all resources to guiding the vehicle through traffic. Distraction is the older driver's enemy, and the consequences of being distracted can really disrupt older drivers' performance. Although simple reaction time is very little affected by age, making more complicated decisions can take longer for an older driver as compared to a young (but experienced) driver in the same situation. Anything in the car design that can either (1) cut down on the number of things to which the driver must attend, or (2) make it easier (both physically or in number of choices) to make the necessary control inputs eases the job of the older driver and enhances safety.

Changes in Physical and Health Condition

As we age, even if we do a lot of exercise and stretching, the joints become stiffer and the range of motion decreases. Only a little, if we stay in good shape, much more if we don't. Diseases such as osteoarthritis make this worse, of course. Muscles also weaken with age, such that a man of 60 has only 75% of the muscle mass that he had when he was 20. Getting in and out of a vehicle is more difficult for older people than their younger counterparts, although the amount of impairment ranges from trivial to significant.

People lose stature with age, mostly because of degenerative processes in the spinal column. Osteoporosis, loss of bone mass, is becoming much less common than years ago, but still affects large numbers of older people. They become much more vulnerable to injury in a crash than younger people.

Chronic health conditions such as Type II diabetes, heart and vascular disease, high blood pressure, atrial fibrillation, and many others can affect driving performance because the powerful drugs used in their treatment can have adverse effects. Adaptive equipment usually cannot be expected to compensate for such effects, however.

Assistive Technology and the Older Driver

Assistive Technology is defined as “any item, piece of equipment, or product system, whether acquired commercially, off-the-shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities.” As we have seen, all of us have certain disabilities, some of which are associated with the aging process.

Assistive technology specifically designed for people with well-recognized disabilities tends to be custom-tailored to a very small market, and sometimes costly. The devices and systems are, to a large extent, paid for by third-party agencies such as vocational rehabilitation, health and human services, and insurance companies. This guidebook describes a special kind of assistive technology, automotive adaptive devices, but some of the approaches outlined come from other sources not usually associated with assistive technology. People who are disabled as we generally think of the term, are no different than you and me; they don't want their vehicle or their lives surrounded by the kind of “medical” equipment typically found around hospitals or rehabilitation centers. Older drivers who might benefit from assistive devices or designs may not accept such things if they have that “medical” look. Let's keep that in mind as we discuss the various approaches to dealing with limitations through the use of technology. It's got to work well, but it's also got to look good or at least unobtrusive.

Automotive Adaptive Equipment: An Overview

As a general statement it can be said that at present the state of the art in automotive adaptive equipment can compensate for great reductions in range of motion, dexterity, and especially strength that come about as age overlays disability. Electronic and computer-mediated adaptive equipment are very available, but very costly. A minivan especially converted for people with disabilities has a lowered floor, a power door, and power ramp. This conversion costs over 16,000 dollars (on top of the price of the vehicle). Adaptive equipment to allow the owner to drive, say, from a wheelchair can cost as much as 15 or 20,000 dollars in addition to the price of the vehicle modification. The point is, disabilities that are worsened by the aging process can be accommodated with modern technology (and it's becoming easier every year) but it does cost a lot of money, something older people, no longer covered by state or provincial vocational rehabilitation programs, may not have at their disposal.

Automotive adaptive equipment is designed to facilitate or make possible:

- Access, getting into and out of a motor vehicle, particularly without assistance
- Occupant protection, restraint system fastening and unfastening, including wheeled mobility aid tiedown

- Subsystem control: Mode A – those controls that must be operated while the vehicle is under way; Mode B – those controls that can wait until the vehicle is at rest, e.g., at a traffic signal; Mode C – the rest of the vehicle controls that need not be operated unless the vehicle is parked or out of traffic
- Primary control: accelerator, brake, and steering
- Navigation or way finding

An example of a very elaborate yet well-integrated adaptive control approach for an individual who is quite disabled is shown in the accompanying photo.



Most approaches for adapting people who have grown old and have disabilities associated with aging would not be nearly so elaborate (or expensive). This example illustrates, however, what is possible with modern technology. The person who drives this rig cannot transfer from his power wheelchair, has no sensation below his upper chest line, has only limited arm mobility, and his hands are completely limp. Yet he is fully employed as a professional. If a person with profound disabilities can be successfully adapted to remove or reduce the handicap from those disabilities, as far as independent driving goes, then it should be easy to supply adaptive technology to compensate for age-related disabilities in driving. At least that is the hope.

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CHOOSING THE “RIGHT VEHICLE”

You may be in the market for a new car or a pre-owned (used) car. Quite often, as people retire they buy a vehicle that will suit their needs in retirement, which may be different than what they used for commuting, hauling kids around, or at work. In our time, “retiring” can mean a lot of different things, from a relatively leisurely life style to an outright change in career that may bring fresh new challenges, and may require different kinds of personal transportation. When Ford Motor Co phased out their best-selling Escort series, and brought out the Focus, they made a special effort to include design considerations for the older driver. Ford went so far as to build a space suit- like “age suit” that limits joint mobility, and has goggles to simulate vision through cataract (both fogging and yellowing). It has gloves to limit touch and simulate hands impaired by arthritis. GM has had similar design approaches to many of their vehicles in the past, notably the late lamented rear-wheel-drive Caprice. As in so many other areas of product design, designing for the older (and also those who are disabled) can often result in products more usable for everyone.

So, if you are in the market for a new or different vehicle, here are some general considerations to keep in mind. We make no attempt here to try and sell you on any particular make or body style—selecting a vehicle is too personal for that. You may recognize some of the examples we are going to show you, but the photos are purely for illustrative purposes, not to try and influence you for or against any particular vehicle.

Inside Visibility

Let’s look at panels with different ideas of design, and see which one might suit you better. On the next page is an example I found at an auto show recently:



The layout of the central console almost guarantees that you will have your eyes off the road for quite a few seconds while you adjust the low-placed radio-cassette unit. The heating and air conditioning panel, which is operated far less than the radio by most people, takes a top position here. Note the very small lettering on the many, many pushbuttons and under the knobs. Let's now add some real-world glare and presbyopia (what you wear reading glasses to correct) and see how this same panel looks:



Now let's look at another panel I saw at the auto show, which is a little easier on the eyes, and should require less time and concentration to use:

The stereo's a lot higher, the labeling is more legible, and contrast on this panel is



better. Note the white dials on the instrument panel; these are more legible for the older driver than the more common aircraft-like black dials with white markings.

The Focus panel is even better in this regard, even in brilliant glare. Note, too, the simple rotary selector knobs used for heating and air conditioning, easy to feel without taking your eyes off the road.

Look for features like these on the next car or truck you buy. How easy will it be to be driving down the road and operating things like the radio and the heating/AC controls, wipers, washers, without more than a very brief glance at the panel, which is all you can afford in many traffic situations.



Ford Focus Radio and A/C Panels

Outside Visibility

Cars and trucks differ on how much the window pillars and the design of the hood, fenders, and rear quarters obstruct visibility. Later we'll have some ideas for you on how to adjust your side mirrors to eliminate "blind spots," but here we are still in the process of buying a new or different vehicle to fit your needs as an older driver. If the vehicle has significant blind spots, you may be able to compensate for them by moving in your seat, mirror adjustment, or even extra mirrors. But you may have limitations on all of these. Maybe you don't have the mobility or flexibility you had in your younger years, especially in head movements. Mirrors have a limited area and range of adjustment (be sure and get power mirrors!), and extra after-market mirrors may be hard to get, expensive to buy and get installed, and may detract from the appearance of the vehicle.

Windshields Tinted windshields are the standard of the industry. They reflect and absorb something like 35 per cent of the light coming in (the strip at the top absorbs the most light, of course). Sometime, just compare the light when you lean out the driver door and look straight ahead to what you get inside behind the wheel. The area of deepest tint, at the top of the windshield, varies from vehicle make to vehicle make, and can even be special ordered as to how far down the windshield it goes. If so, keep your

tint line above your normal line of sight. Because any glass loses transmission through reflection when it is tilted, the approximately 60 degree tilt accounts for close to 12 per cent of this loss. Age, road dust scour, scratches (especially from worn and dirty windshield wiper blades) cuts down and scatters light still more. This is all to the good for (somewhat, not much) limiting heat buildup inside the vehicle and improving air conditioning performance *in daylight*. It's obviously bad at night, especially for older drivers who have not had cataract surgery and have a yellowed, thick lens still in place. This and restrictions on pupil size (regardless of whether you have surgery or not) make it important to have as much light as possible for night driving. If you have significant problems seeing the road, obstacles, or signs at night, try the comparison of what you see through the windshield versus leaning out the door. You will probably be surprised!

Other Windows Factory and after-market tinting is widely available and relatively inexpensive. Heat and light transmission is reduced by as much as 75 per cent or more, so these treatments should be approached with caution if you have problems seeing at night. Many states allow tinting of the driver and passenger side windows, but it would be better to forego such drastic tinting. You'll never see the encroaching pedestrian or cyclist coming from the side, and you may miss other cross traffic as well. Other (to the rear) side windows can be tinted, if you have adequate visibility around your vehicle via mirrors. The rear window is another matter; heavy tinting on this window will limit visibility at night, and may make close traffic look as though it's further off because it will appear dim in your rear vision mirror. Most if not all vehicles come with a "dimming" or tilting rear vision mirror, some of these work electronically. If you opt for tinting on your rear glass, you may as well forego the luxury of a automatically dimming mirror!

Mirrors Some vehicles, notably trucks, full-size vans, and some minivans have large side mirrors. Others have quite small mirrors, although the right-side mirror usually is a convex "wide angle" mirror to help make up for the small size. Any mirror, from the driver's position, should be large enough in width to allow you to see the image in it with both eyes at once; any vehicle sold in the US will meet this very modest standard. The vertical (height) dimension should be adequate to accommodate you whether you are sitting fairly straight behind the wheel or slumped after a long drive, without adjusting the mirror setting. If you have special problems twisting your neck or turning your body, you should consider one of several dealer-installed "lane changer" mirrors such as the one pictured here. They cost, installed, less than \$50.



Getting In and Getting Out

The best car or truck interior is pretty useless if you have a hard time getting in and out of the vehicle. If you have some difficulties in your present vehicle in turning in your seat, swinging the door open or shut, or getting on or off the seat itself because it is too high or low, you have what is called an *access problem*. Pay careful attention to what in the vehicle is causing you a problem, and obviously avoid such a design in your new vehicle if you possibly can.

Upholstery One of the most frequent show-stoppers in access is the type of upholstery chosen. Cloth upholstery on the seat surfaces, especially the kind called “velour,” is cooler in summer and doesn’t freeze you when you sit on it on a frosty morning. It also “holds you in place” better during maneuvers of the vehicle. Unfortunately, that “clinging” quality can be your worst enemy in access. It makes shifting position, or sliding in/out of the seat almost impossible for many people. I routinely recommend that drivers who are disabled get their seats re-upholstered or slip-covered in vinyl, Naugahide(R), or (if they can afford it) real leather. Such a simple expedient makes all the difference in the world for transferring from a wheelchair or scooter into a vehicle seat. In your next vehicle, consider and try the difference between vinyl/leather and cloth upholstery for yourself. I think you’ll choose the smooth!



Door Latches and Handles

Most contemporary vehicles have arthritis-friendly handles, especially exterior ones, but sometimes the inside handles are a different proposition. Here is the handle and other door panel features of a Ford Crown Victoria.

Compare this design for hand access to the door latch with the Ford Focus.



Note that the latches themselves are very similar, but the built-in assist handle for closing the door or swinging it open is much closer to the hinge in the Focus than it is in the Crown Vic. The Crown Vic door is heavier than the Focus door, which probably accounts for the difference in placement, but in any door, the further the assist handle or strap is from the hinge, the easier it's going to be swing. That's simple lever-arm physics. Be sure and try any car or truck you are interested in on how easy it is to access the latches and assist handles or grips, and to open and shut the doors. You will probably find most of them will work reasonably well, but some may either restrict or pinch your fingers or not give you enough leverage to open and close the doors easily.

Assist Handles Sometimes all models of a car or truck/van line will come equipped with at least one or two assist or "grab" handles to help you in or out of the vehicle. Generally, the higher priced trim lines will have more such features, and the more the better. There is a good example on the next page.

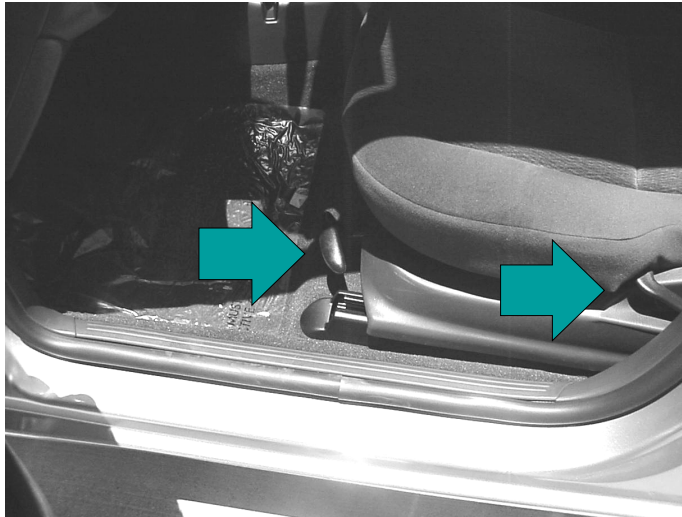


The grab handle is encircled so that you can see it better. It's designed to be unobtrusive but very useful for moving in and out of a vehicle. This particular model has them over each door frame. Other handles can be found midway down on seat backs in minivans, and on the various door pillars. Any of the popular minivans such as the Chrysler line, the Ford Windstar, GMC , or Toyotas are replete with such access aids. Remember even if *you* don't need such assists for entry or exit, you probably have family or friends who certainly do. They are not designed to take your full weight, by the way. They may come out if you try to hang from them! If you need that much support from a handle, you will need an aftermarket one installed by an adaptive equipment dealer (see **Access Enhancements** later in this guidebook).

Dealer-installed Steps and Running Boards These are for minivans, vans, pickups, and sport-utility vehicles (SUV's). Look at what is offered by the dealer and seriously consider having them installed. They are designed to look good with your vehicle and will greatly assist you and your passenger's access to the vehicle. Without such accessories, you will have to carry a step stool like a conductor on a train to help passengers board.

Seat and Pedal Adjustment Adjustable seats have come a long way from the single fore-aft sliding bench seat of yesteryear. Even bottom-line models have individual seat back adjustments, and better-grade power seats are a small wonder. Seats can also be raised by the dealer on many models if you are an especially short person or have advanced osteoporosis. Even manual adjustment seats are much better designed for operability than they were just a few years ago, as can be seen in this example (Focus).

Note the large handle for fore-and-aft adjustment just in front of the seat, and the well-placed handle for seat back angle. Good power seats will give you great flexibility and



range of adjustment: Seat raise/lower; Front edge raise/lower; Rear of seat raise/lower; seat back angle adjustment. They are, however, very expensive and not available in all models.

Some manufacturers have begun offering powered pedal adjustment in some models. If you have some limitations on range of movement of your legs, or your legs are short, and there are others who drive this vehicle not so encumbered, then this is a feature to watch for. Otherwise after-market pedal extensions or blocks can be installed to accommodate you better (these will be discussed under Control Enhancements in a section to follow).

Resources:

Allen, Merrill (1996) "Prescribing for Driving" Ch 6 in Allen, Merrill, et al *Forensic Aspects of Vision and Highway Safety*. Tucson AZ: Lawyers and Judges Publishing Co.

Holzman, David (1999) "Suiting Up for the Golden Age 500" *Technology Review* May, June 1999.

Levy, Roger (2001) Research Associate, Texas Center for Disabilities Studies, The University of Texas at Austin. *Personal Communication*

Pike, Jeffrey (1999) "Protecting the Older Driver – Vehicle Concepts" Ford Motor Company (DRAFT) Chapter in *Transportation in an Aging Society: A Decade of Experience* Transportation Research Board, National Research Council, Washington DC.

Society of Automotive Engineers (1995) *Vision Factors Considerations in Rearview Mirror Design* Surface Vehicle Information Report J985. Warrendale PA: SAE International.

There are things that you can buy and do to enhance your driving performance, even if you are going to drive your present vehicle for years to come. The next sections of this guidebook discuss some of those things....

VISIBILITY ENHANCEMENTS

Windshields

We have already mentioned the amount of light that is reflected and absorbed by the typical windshield. Now take a look at the windshield in your vehicle. Chances are if the vehicle is more than just a few years old that it may have a pattern of fine scratches in its surface. These are caused by abrasion from sand and dirt hitting the windshield as you drive. Some scratches are caused by dirt caught in the windshield wiper blades, and if your blades are like mine, they probably are a little ragged too. Did you know that windshield wipers should be replaced at least once a year, and even more often in extremely hot or cold climates? The vehicle upholstery when the car gets hot inside gives off a kind of vapor which tends to coat the interior glass surfaces, creating a haze. Of course, superimposed on such scratches and haze, is the usual road film, residue from tap water, dust, and insect remains. Considering all this, it's a wonder we can see *anything* through the windshield, particularly at low sun angles and at night.

The dirt and insects are reasonably easy to deal with, using a mild detergent and finishing up with glass cleaner. The interior haze created by plastic and even leather out-gassing and/or tobacco smoke can be cleared with a solution of vinegar and water, followed by glass cleaner. If, after going to all this trouble, things through the windshield still look fuzzier or have less contrast than they do looking at the same scene leaning out the side window, get a magnifying glass and look for the tiny scratches. You will probably find millions of them, and each one scatters the light just a little. In aggregate they can make quite a difference, both in losses in fine detail, and in producing the veiling glare that makes it so hard to see against the rising or setting sun or sometimes with things like bright athletic lighting at night.

It may be possible to have the windshield polished by an automotive glass dealer to eliminate the fine scratches. If there also are cracks, replacing the windshield with a new one will cure any fine scratch problem. If you have problems seeing at night, try getting an *untinted* windshield if one is available for your vehicle. It will make very little difference in how well your air conditioning works.

Visors These vary from vehicle to vehicle. Some are very well designed and even have pull-out extensions to make them even more effective. Others are too small, too large and clumsy, or never seem to cover the area you'd like to shade. Visor covers and extensions can easily be bought at Wal-Mart and other similar general merchandise stores as well as auto parts stores. If you get some visor enhancements, get them in a

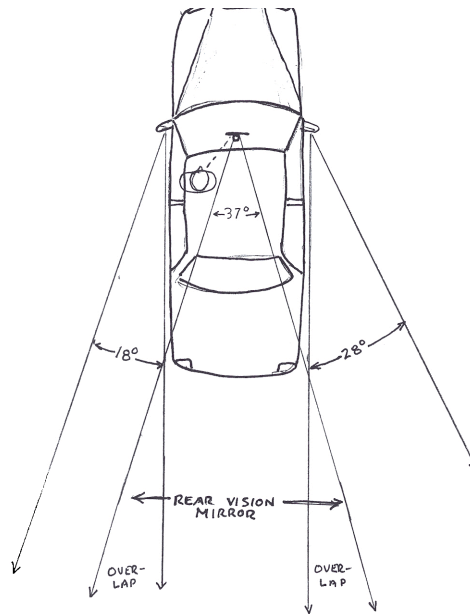
dark color, at least the part close to the edge that blocks light. A well-adjusted visor is your best friend in cutting the light coming in from the sky through the windshield. Adjust it so that all you see is the road ahead and scenery, no sky. You will be surprised how much more sharply you can see objects when the veiling glare from the sky is eliminated. The same goes for athletic or advertising lighting at night. As an older driver, I always have my visors in the down position!

Mirrors

Even if you have both eyes, you can still be functionally one-eyed. This can happen when cataract is much more advanced in one eye than in the other, or if conditions such as epiretinal membranes occur. For this, and for other restrictions in either field of view or head movements, wide-angle and multi-planar replacement rear-view mirrors can be the answer, and at minimal cost (typically less than 100 dollars) as we discussed in choosing your next vehicle. With both left- and right-hand side mirrors all but universal today, the first strategy to try is a mirror adjustment procedure to eliminate the “blind spots” in rear visibility.

Side Mirror Adjustment Procedure

It consists of merely swinging both side mirrors out by about 15 degrees, rather than adjusting them to be redundant with the inside rear view mirror. To do the adjustment, you lean against the B pillar and look in the left side mirror. Adjust the mirror until the side of the vehicle can just be glimpsed. Then lean to the right so that your head is in the middle of the vehicle. Adjust the right side of the mirror until, again, the side of the vehicle can just be seen (even if it's a convex mirror). Now, when a vehicle moves out of the range of rear-view mirror, you will immediately be picked up in either the right or left side mirror. No more “blind spot.”



Mirror Field of View

The diagram here explains the concept, but nothing beats trying it out for yourself. The adjustment will seem very strange at first, because you lose the security of seeing your vehicle side to keep you oriented, at least on the left side. The usual convex (“wide angle”) mirror on the right side will usually allow you to see your vehicle side. You also will see the side terrain whizzing by in the mirror, which will seem strange at first. Try it for at least an hour, noting as you move through traffic that vehicles on either side move from one mirror to the other, and you never lose sight of them until you can catch them in the corner of your eye, right along side you. All this without moving your head! This adjustment is not for everybody, and it may not be comfortable for you. It requires “trusting your mirrors” like truckers have to do. The first thing I do when I get into a rental car is adjust the mirrors as described here. Then I figure out where the rest of the controls are and how they work before I buckle up and take off.

Headlamps

Although there have been many innovations in headlamps in recent years, style sometimes does overcome function, and some headlamps are much better than others. After you make sure yours are properly aimed, if they still seem rather dim and you find

yourself continually selecting high beams (to the annoyance of oncoming drivers!) The first thing to investigate is higher wattage bulbs for your headlamps (easier to do with the current quartz-halogen and other types of separate bulb/headlamp assemblies, as compared to the older sealed-beam units). Your local auto parts store can be helpful, as well as some car dealers. Another approach is to invest in a set of driving lamps, although you should make sure that any after-market lamps that you install are legal in your state. The local DMV should know.

Interior Visibility

In most vehicles of the recent past and today, the tendency has been to provide drak to black backgrounds for much of the dash. Labels and controls are designed to be low contrast with that background to produce a seemingly uncluttered look, for some of the same reasons that consumer equipment such as VCRs and microwaves look that way. Such styling, of course, in the widely varying environment of the motor vehicle, produces what we have called “the Black Hole” for many older drivers. Especially if you are wearing sunglasses (to be discussed below) most parts of the dash and central console area are all but invisible to you when you are driving in daylight. The writer took action a few years ago to enhance the visibility of some “essentials” for him – the radio and cup holders. Take at look at this, in a 1995 Escort:



The somewhat inexpertly drawn white circles (arrow) and delineator lines on the cup holder edges make it possible for me to discern these locations in the “black hole” of my center console with only a momentary glance. You can do the same thing with thin pieces of white plastic tape to help you find things you need to get to under glare conditions.

Another idea is to install (usually in your dome lamp assembly or just over your rear view mirror) a small spot lamp that can help light up these areas at night where built-in illumination is inadequate or does not exist. Police cars often have such spotlamps and they are available at many auto parts stores or even at discount stores such as Wal-Mart. A good expedient that is very cheap and readily available, of course, is a small flashlight kept conveniently at hand in a storage cubbyhole or other storage location. An excellent but somewhat more expensive source of light is the LED (light emitting diode) type flashlights now coming on the market. These are the size of a pen, but provide a flood of light exactly where you point it, with little spill to affect your dark adaptation.

Eyewear

It is impossible to overrate the value of good quality sunglasses for daylight driving. They should have good ultraviolet blocking capability (at least 70-80% UV block) and should be of the polarizing type. Tints to prescription glasses generally do not provide polarizing, which is important for cutting down glare, especially from reflecting surfaces. The best choice would be sunglasses that are coated to be antireflective, and vary in tint from deep to light from the upper section of the lenses to the lower. That cuts out the veiling glare from the sky, but gives you more visibility of the road. These are called “gradient density” sunglasses.

Although yellow or amber sunglasses have been advertised as cutting blue light scatter and thus improving visibility, studies have not shown any real advantage to this color of tinting. Indeed, some amber or yellow tints tend to glow (fluoresce) when the sun’s ultraviolet light hits them, but such light is mostly blocked by the windshield.

Despite what you may have heard to the contrary, never wear sunglasses when the sun goes down; anything that cuts down light transmission to your eyes affects your ability to pick out faint objects (like a pedestrian in dark jogging clothes) especially against a twilight or dawn sky. Tinted eyewear, like a tinted windshield, is a disadvantage at night.

Instead of or in addition to eyewear, some older drivers use an eyeshade to block the glare from the windshield and sky which so limits picking out low contrast objects. A long bill on a “gimme cap” or fishing cap will also serve as a useful eyeshade. A wide-brim hat worn in the vehicle (if you have enough headroom) can serve the same purpose.

Because of the diminished visual acuity characteristic of some older drivers, reading guide signage or other traffic control built to minimum standard sizes can be a real chore. Loss of visual acuity and contrast sensitivity arises from cataract, vitreous separation, macular degeneration, and epiretinal membranes. For these drivers, the use of bioptic telescopic lenses *could* be helpful *if* their use is well-practiced before venturing into traffic. These are spectacles that are fitted with the driver's standard corrective lenses, but also, in the upper edge of the lenses, incorporate a simple telescope or telescopes, in several different forms. Your dentist or physician may use something similar but a microscope to magnify objects (such as a mole) that are close. Some bioptic lenses are for both eyes, others are built into only one lens. Typically they are optically the same as an old-fashioned pair of opera glasses, and magnify 1.5 to 2.5 times or even more. They are generally prescribed for people with "low vision" (corrected visual acuity is between 20/70 and 20/200) but could be used by others with better vision. The driver lowers their head to bring the telescope (it has a large exit pupil) into play when they want to see a below-threshold sign or other object. A California study has sounded a note of caution regarding accident experience with these devices, but it should be noted that the drivers in this study had "low vision." States have different regulations concerning the use of these lenses; they are also very expensive.



Photo Courtesy Ocutech, Inc.

Resources:

Allen, Merrill "Prescribing for Driving" in Allen, M. et al *Forensic Aspects of Vision and Highway Safety* Tucson AZ: Lawyers & Judges Publishing Co. 1996

Platzer, George, as quoted by Perel, Michael *Personal Communication* 1999.

Pitts, D.G. "The Effects of Aging on Selected Visual Functions: Dark Adaptation, Visual Acuity, Stereopsis, and Brightness Contrast" in Sekuler, R., Kline, D. and Dismukes, K. (Eds) *Aging and Human Visual Function* New York: Alan R. Liss, Inc. 1982

Wainapel, S. and Bernbaum, M. "Rehabilitation of the Patient with Visual Impairment" Chapter 69 of *Rehabilitation Medicine* op.cit.

Clarke, N. "An Evaluation of the Traffic Safety Risk of Biotopic Telescopic Lens Drivers" Report RSS-96-163, California Dept. of Motor Vehicles, Research and Development Branch, Division of Program and Policy Administration, Sacramento, CA March 1996

AUDITORY ENHANCEMENTS

For older drivers with moderate hearing loss, one of the major problems inside the vehicle may be detecting turn signal “clicking,” auditory warning signals such as “key in ignition,” “headlamps on,” or “fuel low.” Some of these audio alarms and signals have warning lights paired with them, a good approach. These alarms can sometimes be supplemented by after-market equipment, but drivers may not appreciate the loud signal. The Auto-Minder (R) and the Blinker Buddy (R) are two examples of such equipment that cost less than \$100 (plus installation). For those drivers with severe hearing loss, of course, there is no alternative to providing a visual signal. A master alarm indicator, designed to flash in some pattern to draw attention, can be a very effective approach and one not particularly expensive to have installed.

A device called E.A.R.S. marketed by HearMore can alert a driver to the approach of emergency equipment or police cars by flashing bright warning lights at the driver from the dashboard or other location within his or her range of vision. In the future, one can imagine being able to go through the vehicle computer to onset a master alarm when it detects any of the out-of-tolerance situations. The driver knows something is wrong, and can then search for the specific indication.

Resources

HearMore Products (1-800-881-HEAR) or on the Web at www.hearmore.com.

CONTROL ENHANCEMENTS

There are quite a few different kinds of both products and modifications that can be made to the controls of a motor vehicle to make it easier to use by people with limitations. Adaptive equipment meant for those with definite disabilities can also be used by those who are really not disabled but do need a little assistance. First, some terminology and general considerations about controls. They are classified either as *primary controls*—those that are used to steer, accelerate, and brake the vehicle; or as *secondary controls*—those controls that operate everything else about the vehicle. When it comes to modifying or adapting controls, priorities come to mind as well. Some things are vital to driving the vehicle, others are nice to have, but don't really justify spending a lot of time and money to modify. There are three levels of priority: A, B, and C.

Priority of Motor Vehicle Controls for Adaptation

Priority A: ***must** be accessible to the driver with the vehicle in motion*

Accelerator - Brake - Steering Primary Controls
Cruise Control - SET
Headlamp Beam Selector
Horn
Turn Signals
Windshield Washer/Momentary Wipe

Priority B: *can wait until the vehicle is not in motion*

Transmission (automatic)
HVAC
Exterior Lamps
Windshield Wipers
Parking Brake

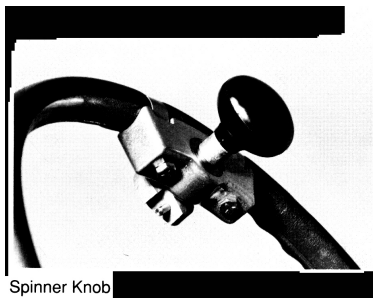
MODE C: *can wait until the vehicle is out of the travel way*

Ignition and Engine Start
Seat Controls
Power Windows
Door Locks
Cruise Control - ON
Hazard Flashers
Interior Lamps
Mirrors
Rear defrosters/wipers/washers

Other equipment such as radios, cellular telephones, fuzz busters, and navigation aids are not in this priority list because they are directly concerned with vehicle operation. They are “extras” that we use as we have time while in any of the levels of priority—under way, waiting at a traffic signal, or parked.

Priority A: Primary Control Enhancements

Adaptive equipment for steering, accelerator, and brake have been around for a long time, and you have probably seen some of the devices at one time or another. If you have restrictions in either range of movement or in strength, perhaps because of osteoarthritis, fibromyalgia, or maybe just an old football injury, then simple extensions to bring the controls more within reach or to decrease the force needed to operate them are readily available. Almost all modern motor vehicles have power assisted steering and brakes. A simple steering knob shown below mounted at about 2:O'clock on the steering wheel can make parking maneuvers a lot easier for a person with arthritic hands or arm movement limits. The knob can be removed by pressing a button at the side of the mount when others drive the vehicle.



Spinner Knob

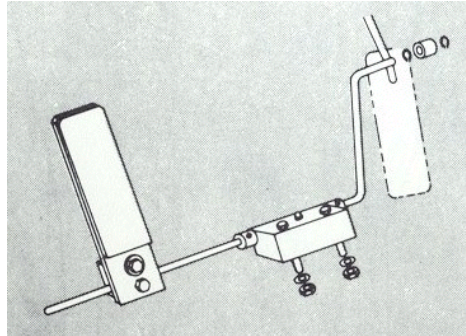
As is true with other kinds of add-on equipment, introducing such a knob presents a greater risk of injury in a collision than would otherwise be the case. As in most things in life, the benefit of having such an assist must be balanced off against the cost—increased risk of facial damage—in an accident.

If you have leg movement limitations or trouble raising your legs to operate the pedals of the vehicle, there are devices that can help. Simple extensions can be installed on both the brake and accelerator pedals (clutch pedal too, if you have a vehicle with a manual transmission) to bring the pedals closer and perhaps lower to accommodate you better. They should be installed by an adaptive equipment dealer familiar with these devices, since you want to keep all the pedal travel available to you.

If you have limitations or have lost the use of your right leg for any reason, two options exist on automatic transmission equipped vehicle. One is the left-foot accelerator, a simple device that is mounted on the floor underneath the pedals. A U-shaped member pivoted at the bottom presses the vehicle accelerator when the left side of the U (on which a pedal pad is mounted) is pressed with the left foot. This unit is pictured here.

The unit can be swung out of the way or removed from its mounting when someone else uses the vehicle.

The other option is quite a bit more elaborate, the mechanical hand control, shown here.



This type of control is usually associated with people who have a significant amount of disability, but if your limitations of leg or foot movement are likely to get worse with time, it's definitely something to consider. The mechanical hand control operates both accelerator and brake, accelerator by pulling the handle down toward your lap, brake by pushing forward on the handle. Some models operate the accelerator in different directions, pulling straight back or even rotating the handle like a motorcycle throttle. The much simpler left foot accelerator has a significant disadvantage, since pedal expectations built up over a lifetime of driving must be reversed, because the brake is now to the *right* of the accelerator. In an emergency, the two pedals can be confused

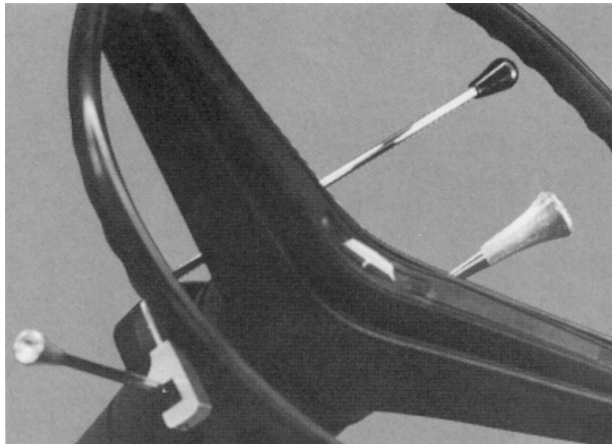


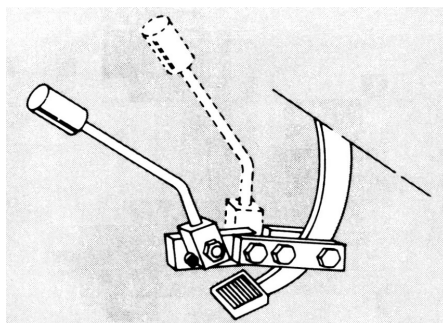
with disastrous consequences. The mechanical hand control is a completely different way to operate both pedals, so at least nothing has to be *unlearned*. Modern hand controls as you can see in the picture are relatively unobtrusive and do not significantly interfere with conventional use of the pedals by another person.

Priority A: Secondary Control Enhancements

Simple extensions for any of the controls of the vehicle are either commercially made, such as the turn-signal extension pictured below, or can be readily fabricated by a shop experienced in adaptive equipment. Similar devices are available for the automatic transmission lever. Such handles serve to bring the control within reach or make it available to another hand.

Another example of a useful extension is for the parking brake, which can be difficult to engage for those drivers with peripheral neuropathy or other limitations to hard application of a foot pedal. This extension transfers the operation to the left hand.





Brake Pedal Extension

One particularly difficult operation for someone with arthritic fingers is to turn the ignition key to start the vehicle. Very simple key holders are available to solve this problem, as shown in the next photo. This holder has stiff joints which can be moved to provide the best fit and leverage for its user. Other devices are even simpler, and consist of a rigid jackknife-like bar into which the keys are fitted.



Other Control Enhancements

Buttons or switches that are hard to push or get to can be enhanced by simple stick-on clear plastic raised buttons such as those shown here. These “feet” are available from Radio Shack and can even be found at such stores as Wal-Mart and K-Mart where they are sold to be placed on the bottom of appliances such as microwaves and blenders.

The next page shows how these very cheap extensions can solve an accessibility and search problem.





In this example, I found it difficult to find and then press the AM/FM switch, I was always hitting one of the other station selection buttons instead. Affixing one of these “feet” cured the problem. I can find the AM/FM button on the first try, saving precious time with my eyes off the road!

Resources

Many adaptive equipment dealers and vehicle modifiers belong to a trade association, the National Mobility Equipment Dealers Association (NMEDA). A call or web site contact will provide a NMEDA dealer in your area.

NMEDA
11211 N. Nebraska Ave
Suite A-5
Tampa, FL 33612
www.nmeda.org

Koppa, R. (1990) "State of the Art in Automotive Adaptive Equipment" *Human Factors, the Journal of the Human Factors and Ergonomics Society* Vol. 32, 439-455, 1990.

ACCESS ENHANCEMENTS

It's all very well to have gadgets of one kind or another inside your vehicle to provide a better fit for you, but they won't do much good until you get inside. Vehicles are generally designed to fit people ranging from the small (5th percentile) female to the large (95th percentile) male, but "fit" means different things to different folks. A person with chronic low back pain (a common complaint among older drivers) would prefer an entrance that minimizes stooping and bending, let alone twisting to get in. A person with arthritic hands wishes for a light door that is easy to open and close. Stepping up on a door sill may be difficult for a person with knee problems or who is unstable on their feet. Fortunately, there are quite a few different adaptive devices to make getting into and out of a vehicle at least a little easier.

Steps and Handles

The simplest devices are sometimes the most effective. Some of us can still remember when cars (and trucks) came equipped with running boards—steps—that made it easy to get inside a vehicle and get out too. These vehicle features are long gone, but can be put on as after-market items on some (but not all) vehicles. Most sport-utility vehicles can be equipped with steps or running boards, almost all minivans, and all pickups. Full-size vans are often equipped with running boards or steps as part of a factory or after-market custom conversion. It's a well worth-while investment if you or anyone in your family or associates have problems stepping up into your vehicle. The only other alternative is a step stool, which sooner or later will either tip over or will be left behind. Your local dealer for your make of vehicle is your best resource for access devices like steps, although an after-market truck and van customizer shop can also be a good resource for advice and the equipment you need. Here are running boards on a pickup:





On this SUV you can see the unobtrusive dealer-installed steps that make access so much easier.

Handles are strategically placed inside vehicles to aid getting in and out, as we have seen in the section in Choosing the Right Vehicle. Outside handles are hard to come by, however, although one company sells portable handles that can hung inside or outside a door sill. It is hard to find a surface on the outside of most vehicles except full-size vans where a grab handle or hand rail could be mounted. Also, there are appearance considerations also. Handles similar to those found in plumbing supply stores to assist in access to showers and tubs will be good for exterior mounting on vehicles since they are designed for the damp environment of bathrooms. They are also designed to be compatible and comfortable to use by persons with limitations of grip strength.

Seats

Seats that are cloth covered and fight your getting in (and especially out) can, of course, be slip covered or even re-upholstered with lower-friction material such as vinyl or Naugahide (R). Cost is around \$100 per seat for slip covering, and about twice that for re-upholstering. At considerably more cost the whole seat can be replaced by a much more comfortable, easier to use seat. Choice of an ergonomically designed seat for your vehicle is an expensive proposition, but may be worth it if you are going to keep the vehicle for a long time, and the present seat is both hard to get into and out of, and uncomfortable to boot. You should sit in any vehicle seat for approximately as long as any drive you might make (at least an hour for most people) before deciding whether or not it is comfortable for you. Most people sit in a vehicle five minutes or less before making a purchase decision!

A simple gadget can be purchased (less than \$30) that could make all the difference in getting in and out of a vehicle seat. This is a nylon seat overlay that has a non-skid surface underneath to help hold it in place, with hand loops to grip. It is called the Car

Slide. A little more sophisticated is a clever swivel seat that can be placed on the vehicle seat. The padded cushion on top swivels 360 degrees, and lets the user easily turn to get out of or into a vehicle. Simply sit down, and swivel in or out. Seat belts are fastened in the usual manner.



Photo Courtesy Bruno Corp

For considerably more money, several manufacturers offer a complete replacement seat on a rotating base. The Bruno Turnout (R) is an example of this approach. The optional seat is a complete captain's chair type unit, with built-in armrests, although the original seat can also (usually) be used. The seat base rotates up to 116 degrees from straight ahead, depending on what kind of vehicle the base is custom designed for.

These seat bases are built for passenger cars, minivans, full-size vans, and pickup trucks. They should also fit most SUV's as well. A slightly more advanced model is the Braun/Crow River Mobility Seat pictured below. This is a complete seat assembly that replaces the original vehicle seat. The seat has the standard recline feature and an adjustable head rest, but in addition, the seat rotates outward and then actually moves the occupant out away from the door sill for a very easy entry or exit. The manufacturer claims that the seat can be installed as a bolt-in unit in less than 2 hours. These seats



Photo Courtesy Braun Corp

and bases cost under \$2000 installed.

If you have a full-size van or a minivan, and have some limitations in getting out of your seat and moving around the vehicle, the seat can be placed on a powered platform which can rotate about 120 degrees, move back and forth, and up and down.

This versatile seat base can also accommodate a power seat originally in your vehicle to give you even more flexibility in adjustment. Installed, these units sell for around \$2000 or even less (base only).



If you have a high clearance vehicle such as a pickup or full-size van, and steps do not work well for you, another (expensive) approach is the installation of a personal lift device. The Bruno EZ Rizer (R) is pictured here. This personal lift folds flat against the side of the seat when not in use. It raises and lowers the rider from the seat level to about 18 inches from the ground. It will fit any domestic full-size pickup (half-ton) and van. It retails between 3 and 4 thousand dollars, installed. The control box is usually secured to the door panel but can be mounted anywhere. The EZ Rizer (R) installs in both the driver side and passenger side of most (but not all) trucks. As always with



Photo Courtesy Bruno Corp

such devices, *check with the dealer for suitability for your vehicle before you buy!*

Loading Devices

Some older people have problems stowing heavy sacks, packages, or other items in the trunk spaces of their vehicles. For less than \$2,000 simple hoists are available to ease this chore. These units are made by several manufacturers, and the Bruno Space Saver (R) is shown here as an example. The scooter could just as easily be a heavy sack of cow manure in a sling. The electrically operated hoist, simply a small crane, easily disassembles out of the way in the trunk of the vehicle when it is not in use.



Photo Courtesy Bruno Corp

Minivan manufacturers starting in 2000 are offering power doors and hatches for the first time. For those who have older vehicles of this kind, or an SUV with a heavy rear hatch, Courtland Industries of Canada offer a power hatch assist unit ("Load 'n Go") which can be installed without a great deal of effort. The cost is under \$2,000.

Resources

The following is just a partial list of resources for the equipment described in this section:

Northcoast Medical Functional Solutions (Online Catalog) at www.Northcoast.promptu.com
Swivel seat cushion

Dynamic Living Inc. at www.dynamic-living.com *Swivel seat cushion and portable hand hold*

Maddak, Inc. Ableware (R) Catalog 6 Industrial Rd, Pequannock NJ 07440-1993
Car Slide

Sammons Preston P.O. Box 5071, Bolingbrook IL 60440-5071 (800) 323-5547
or www.sammonspreston.com. *Handles*

Braun/Crow River Industries, 2800 Northwest Blvd Minneapolis MN 55441 (800) 488-7688
Mobility Seat

Bruno Independent Living Aids, Inc P.O. Box 84, Oconomowoc WI 53066 (800) 882-8183
or www.bruno.com. *Turning Automotive Seating, EZ Rizer, Space Saver*

Courtland Mobility Services 5125 Harvester Rd, Unit 7, Burlington, Ontario, Canada L7L6A2 (800) 354-8183 *Power hatch operator*

INTELLIGENT VEHICLES COMING

You have probably read something in the newspapers or watched on TV about “Intelligent Transportation Systems (ITS), part of a world-wide government-industry thrust to get more out of our existing transportation system through electronics, communications, and computers. Whole books and tons of reports have been written about revolutionary re-thinking of our transportation system, ultimately leading to such things as automated guideways in which vehicle drivers let the highway do the driving to a destination. All new vehicles have on-board computers, and very soon (in fact now in some high-priced makes) drivers will be able to communicate directly with their vehicle computers to do such things as voice command wipers to come on, heat or air conditioning settings to change.

Simplicity through Complication

The trend in technology is usually from complication to simplicity in operation, while the underlying components and electronics get more and more complex in design in order to provide that simplicity in operation. My first car, a well-worn 1939 Chevrolet, was a very simple car by today’s standards, with few of the accessories that we now consider essential (such as turn signals). But operating that old car was pretty complex: manual choke, manual hand throttle (for fast idle), kick starter on the floorboards, manual 3-speed transmission. The simplest subcompact you can buy today is a marvel of technology compared to that old Chevy, but it is also very simple to operate, especially with an automatic transmission. Turn the key and go! Futurist designers now say that cars of the future will look very simple like that old Chevy or like cars looked on the interior back in the 1920's. There won't be the arrays of knobs, buttons, and levers we saw in the examples pictured in earlier sections of this guidebook, like this:



Now here's a retouched version of the same photo, with everything simplified. All the functions operated by knobs and pushbuttons in the first photo are still there, but now they are voice operated or there is a multi-purpose "smart stick" coming out of the panel (or both).



Advanced Communication Systems and Services

ITS is in its infancy (less than 10 years old) and many of the systems talked about now introduce a great deal of complexity and information overload to the driver, a worrisome prospect. Motorola and Carion, for example, have demonstrated an advanced communications unit that might replace the stodgy old AM/FM/cassette or CD player that is probably in your dashboard. It will give you all that, plus audio right off the web sites of your choice (stock market quotes, etc) and directions to destinations using the Global Positioning System. Such systems are also represented by the currently available General Motors OnStar system which provides (at an initial cost and monthly service fee) an array of news, emergency, and traveler information services. Soon, all GM vehicles will have OnStar as an option, and the service will undoubtedly be extended to other makes as well. This technology goes under the name of "Telematics."

Collision Avoidance Systems

Another kind of intelligent vehicle system that is rapidly becoming available (although very expensive, as yet—close to \$3,000, but the price is bound to drop—a lot). These are collision-avoidance systems. The Ford Windstar this year (2001) has a simple rear obstacle warning system available, that could keep you from backing over your grandson's bike, or your grandson, for that matter. Other systems on the way provide blind spot warnings, built in, for example, into your side mirrors. "Smart cruise control," as it is called should be widely available in just a few years. It can be found on some very expensive makes such as Mercedes now. Smart cruise control does all the things you are used to on the cruise control you probably have on your present vehicle, plus it warns you if you are getting too close to the vehicle in front. The system, if you choose to ignore the alarm, can also put on the brakes for you, so as to maintain a set distance between you and the vehicle in front.

Possibly even more useful, but also introducing new complexity, is night and fog vision, now available on several luxury cars, notably Cadillacs. An infrared camera picks up obstacles in front of the vehicle (particularly people, who radiate a lot of infrared—heat) and displays that image over whatever can or can't be seen through the windshield. If delineation (lines, markings, and signs) can also be made to emit or reflect infrared, a great deal can be gained in visibility when you drive on days or nights when otherwise you'd be better off watching TV by the fire.

Implications for the Older Driver

Which of these new systems will really help you and me do our essential driving tasks in a safer and more enjoyable way remains a judgement call, but it is noteworthy that government regulation may take a hand. In some locales, hand-held cellular phones have been banned, since they are thought to be distracting to a driver. Doubtless in a few years, every new car will have a built-in (hands free) cell phone, probably as part of the advanced communications system described above. Other technology will also be there, but such advances will come about in the middle of fears in many quarters that driver distraction will increase. The rule of thumb that headed up this section should be kept in mind: as systems become more sophisticated they become (or should become) operationally simpler. Some devices in everyday use seem to defy this rule, the Video Cassette Recorder (VCR) is one good example, but in the long run even it will succumb to simplicity in operation through complexity in design.

If you're like me there are features on my VCR that I simply don't use, just like there are many bells and whistles on this Windows 95 computer I'm using to write this section that I have never bothered to learn, and never miss. As long as these features don't get in my way, I don't mind if they are there for those interested in learning and using them. Of the 12 services available with OnStar, I would probably use no more than six. Intelligent vehicle features (many to most of which are only available on a *new* vehicle)

that seem to be distracting you from driving, however slight, should not be used when you are driving. Robots will never rule as long as people have shutoff switches!

Collision avoidance devices hold the most promise for easing the workload of all drivers, especially older drivers with more limited range of motion. If you “trust the system,” a big if, then the chore of driving in dense traffic should be greatly eased. Whether or not a takeover braking system that simply will not let you come closer than a predetermined distance to another vehicle or object will result in more, rather than less, unease at not being in full control of the vehicle remains to be seen. Just as in present-day “dumb” cruise control, override by a human should always be possible, but how to make that happen still requires research.

With route guidance systems, the key is also trusting the system and presenting the information in such a way that the driver is assisted rather than distracted. The writer sometimes uses a pocket digital recorder to provide route guidance to new destinations since his distance vision is subpar (much less so since cataract surgery). Guide signs can be hard to read, and may not provide information that meets expectations. The directions are in the form of a list of major steps in the trip, with added information on landmarks and other confirmatory information. The recorder is more high tech than my former (and still used) approach of writing the route, step by step, on 3x 5 index cards I keep in my shirt pocket. The advantage is, of course, that the recorder can be used at night, and does not require as much time looking off the road as the card. The on-board guidance systems now and in the future can do the same thing in different formats (both audio and visual) for any destination, right now, and from where you are, right now. The key again is selecting that form of guidance which you have found works best for you. If you’ve always pulled over and used a (formerly free) service station map to plan a route, then a step-by-step format may not be for you. If your companion is the one who gives you route guidance as needed, “Turn left on Route 43 to Kyber Junction,” then the step-by-step format may be just what you need.

In a word: “Keep it sweet and simple.”

Resources

The best resource for what's going on in ITS is the ITS America national society website: www.itsa.org. This site will take you to a lot of related sites on various aspects of telematics and collision avoidance including government sites. The state-of-the-art is literally changing every day, but watch for these features as the news model cars and trucks come out.