



Federal Register

**Friday,
June 15, 2001**

Part III

Department of Education

**National Institute on Disability and
Rehabilitation Research; Notice of Final
Funding Priorities for Fiscal Years 2001–
2003 for Three Rehabilitation Engineering
Research Centers**

DEPARTMENT OF EDUCATION**National Institute on Disability and Rehabilitation Research; Notice of Final Funding Priorities for Fiscal Years 2001–2003 for Three Rehabilitation Engineering Research Centers**

AGENCY: Office of Special Education and Rehabilitative Services, Department of Education.

ACTION: Notice of Final Funding Priorities for Fiscal Years 2001–2003 for three Rehabilitation Engineering Research Centers.

SUMMARY: We will announce final funding priorities for three Rehabilitation Engineering Research Centers (RERC) on Technology for Successful Aging, Wheelchair Transportation Safety and Mobile Wireless Technologies for Persons with Disabilities under the National Institute on Disability and Rehabilitation Research (NIDRR) for FY 2001–2003. We take this action to focus research attention on areas of national need. We intend these priorities to improve the rehabilitation services and outcomes for individuals with disabilities.

DATES: These priorities take effect on July 16, 2001.

FOR FURTHER INFORMATION CONTACT: Donna Nangle. Telephone: (202) 205–5880. Individuals who use a telecommunications device for the deaf (TDD) may call the TDD number at (202) 205–4475. Internet: Donna.Nangle@ed.gov.

Individuals with disabilities may obtain this document in an alternative format (*e.g.*, Braille, large print, audiotope, or computer diskette) on request to the contact person listed in the preceding paragraph.

SUPPLEMENTARY INFORMATION: This notice contains final priorities under the Rehabilitation Engineering Research Centers (RERC) on Technology for Successful Aging, Transportation Safety and Mobile Wireless Technologies for Persons with Disabilities under the National Institute on Disability and Rehabilitation Research (NIDRR) for FY 2001–2003.

The final priorities refer to NIDRR's Long-Range Plan (the Plan). The Plan can be accessed on the World Wide Web at: <http://www.ed.gov/offices/OSERS/NIDRR/#LRP>.

National Education Goals

The eight National Education Goals focus the Nation's education reform efforts and provide a framework for improving teaching and learning.

This notice addresses the National Education Goal that every adult American will be literate and will possess the knowledge and skills necessary to compete in a global economy and exercise the rights and responsibilities of citizenship.

The authority for the program to establish research priorities by reserving funds to support particular research activities is contained in sections 202(g) and 204 of the Rehabilitation Act of 1973 (the Act), as amended (29 U.S.C. 762(g) and 764). Regulations governing this program are found in 34 CFR part 350.

Note: This notice does not solicit applications. A notice inviting applications is published in this issue of the **Federal Register**.

Analysis of Comments and Changes

On April 10, 2001, we published a notice of proposed priorities in the **Federal Register** (66 FR 18688). The Department of Education received 13 letters commenting on the notice of proposed priorities by the deadline date. Technical and other minor changes—and suggested changes that we are not legally authorized to make under statutory authority—are not addressed.

Priority 1: Technologies for Successful Aging

Comment: One commenter feels that this priority should address the communication needs of older Americans with communication disabilities in order to individualize their rehabilitation and optimize their ability to communicate in their natural environments.

Discussion: NIDRR recognizes the importance of addressing the communication needs of all individuals with disabilities and currently supports an RERC on Communication Enhancement that addresses communications needs of the aging population. An applicant could propose activities that address the communication needs of older Americans and the peer review process will evaluate the merits of the proposal. However, NIDRR has no basis to determine that all applicants should be required to address the communication needs of elderly individuals with communication disabilities.

Changes: None.

Comment: One commenter suggested that a new activity should be added that requires the RERC to develop new technologies in speech generated devices (speech aids that provide individuals with severe speech impairment the ability to meet their functional needs) and accessories such

as mounting systems, switches, and access devices.

Discussion: An applicant could propose activities to develop new technologies in speech generated devices and the peer review process will evaluate the merits of the proposal. However, NIDRR has no basis to determine that all applicants should be required to develop new technologies in speech generated devices.

Changes: None.

Comment: One commenter suggested that a new activity should be added that requires the RERC to develop new technologies in hearing aids, assistive listening devices, and cochlear implants to assist those individuals with severe hearing loss.

Discussion: NIDRR recognizes the importance of addressing the hearing needs of all individuals with disabilities and currently supports an RERC on Hearing Enhancement and Assistive Devices that addresses hearing needs of a broad range of individuals with hearing loss. An applicant could propose activities to develop hearing technologies that would benefit older Americans with hearing impairments and the peer review process will evaluate the merits of the proposal. However, NIDRR has no basis to determine that all applicants should be required to develop hearing technologies.

Changes: None.

Comment: One commenter suggested that a new activity should be added that requires the RERC to focus on the cultural and linguistic diversity of the aging population.

Discussion: An applicant could propose activities that focus on cultural and linguistic diversity of the aging population and the peer review process will evaluate the merits of the proposal. However, NIDRR has no basis to determine that all applicants should be required to focus on the cultural and linguistic diversity of the aging population.

Changes: None.

Comment: One commenter suggested that adding the words “and other service providers” after “home health” would strengthen the fourth activity.

Discussion: NIDRR agrees that adding “and other service providers” to the fourth activity would strengthen the priority.

Changes: The fourth activity has been modified to include the words “and other service providers” after “home health.”

Comment: One commenter suggested that the emphasis in this priority on home-based monitoring and communication technologies is very

similar to the types of activities being conducted at the RERC on Telerehabilitation and suggested that it made more sense for the RERC on Technology for Successful Aging to collaborate with the RERC on Telerehabilitation in these areas and to focus on topics not currently funded. Specifically, the RERC should be required to: Investigate factors that limit access to community resources and socialization by older Americans with disabilities; analyze strategies (both AT and non-AT) that have the potential to prevent loss of function in home and community; investigate personal and public transportation issues that impact the safety and integration of older Americans in their communities, as well as the amount of care required to keep them home; collaborate with the RERC on Ergonomic Solutions for Employment to enhance knowledge of human factors issues in home and community environments affecting the safety and function of older Americans in these environments; and collaborate with the RERC on Telerehabilitation to develop and expand the application of telemonitoring and measure the impact on health as well as community integration and socialization.

Discussion: NIDRR agrees that the RERC on telerehabilitation and the RERC on Technology for Successful Aging should be encouraged to collaborate with one another. NIDRR also recognizes that there are similarities between the two RERCs, specifically activities dealing with the development of monitoring technologies. The RERC on Telerehabilitation is responsible for identifying and developing technologies capable of supporting rehabilitation services for individuals who do not have access to comprehensive outpatient rehabilitation services. The RERC on Technology for Successful Aging is required to focus on technological solutions that promote health, safety, independence, active engagement and quality of life of older persons with disabilities. All of the proposed activities contained in this comment are within the scope of the priority and could be proposed by an applicant to achieve the general purpose of this priority. The peer review process will evaluate the merits of the proposal. However, there is insufficient evidence to warrant requiring all applicants to carry out the activities suggested in this comment.

Changes: The last bulleted activity has been modified to include "the RERC on Telerehabilitation" as a potential NIDRR-funded project with which this RERC may collaborate.

Comment: The scope of this priority should be expanded beyond technologies for monitoring and communications to include technologies for automating tasks (such as rehabilitation robotics) and smart mobility aids (such as power wheelchairs that help the user perform specific tasks like passing through narrow doorways, walkers that keep track of a person's location within his or her home, and manual wheelchairs that automatically avoid obstacles).

Discussion: An applicant could propose to explore technologies for automating tasks and smart mobility aids and the peer review process will evaluate the merits of the proposal. However, NIDRR has no basis to determine that all applicants should be required to propose to explore technologies for automating tasks and smart mobility aids.

Changes: None.

Comment: One commenter believes that the priority should consider the need to marshal the forces of capitalism and the marketplace to encourage industry to develop products based on the solutions created by the proposed RERC.

Discussion: NIDRR agrees with the commenter and points out that the RERC is required under the fifth activity to explore strategies for strengthening partnerships with industry to facilitate the transfer of technologies and applications developed by this RERC.

Changes: None.

Comment: The fourth activity should be expanded to promote knowledge beyond awareness of new and existing technologies and include educational activities designed to teach how the technology is used.

Discussion: NIDRR agrees with the commenter about the importance of including educational activities on how newly developed technologies are used and believe the fourth activity adequately supports this point.

Changes: None.

Comment: Particular attention must be given to the ethical implications of the technologies developed by this RERC. For example, examining technology outcomes, such as ease of task performance or control of daily living activities must be studied in tandem with issues such as: Who has access to data about how I spend my time? Is turning off the monitoring device under my control?

Discussion: All RERCs are required to obtain human subjects approval through their respective Institutional Review Boards (IRB) and show evidence of such approval to the U.S. Department of Education prior to commencing with

any research that includes human subjects. As part of the informed consent process, researchers are required to abide by strict confidentiality rules that protect the identity of all participating subjects. However, once a product (i.e., a monitoring device) has moved beyond the laboratory and is being used by the general public, human subject protection may or may not be valid. For instance, if a person is being monitored (using a newly developed monitoring device developed by the RERC) by a health care institution, patient confidentiality laws apply. This would not be the case if family members are monitoring a loved one. This type of policy issue goes beyond the scope of this RERC.

Changes: None.

Comment: One commenter suggested that the RERC use the services of the "highly developed" Geriatric Education Centers, which are dispersed nationwide, for education, training, and disseminating efforts.

Discussion: Applicants are required under the first bulleted activity of this priority to develop and implement a plan to disseminate the RERC research results to various constituents. NIDRR believes applicants should have the discretion to determine the best way to disseminate their information. An applicant could propose to include the Geriatric Education Centers as part of its plan and the peer review process will evaluate the merits of the proposal. However, NIDRR has no basis to determine that all applicants should be required to use the Geriatric Education Center.

Changes: None.

Comment: Two commenters feel that the high tech requirement of the RERC should be balanced with a public policy activity that targets reimbursement of assistive devices, including high tech communication and monitoring technologies, and health care policy.

Discussion: NIDRR agrees there are complex policy issues that affect reimbursement of assistive technologies, both high and low tech, for all persons with disabilities. The Assistive Technology Act of 1998 (AT Act) funds projects to identify, describe and work to remove barriers that confront all persons with disabilities in their attempt to acquire assistive technologies. NIDRR will expect this RERC to work closely with relevant AT Act projects in addressing complex policy issues surrounding reimbursement of AT devices that would benefit the aging population.

Changes: The last bullet has been modified to include "AT Act projects"

as potential NIDRR-funded projects with which this RERC may collaborate.

Comment: One commenter suggested that it would be beneficial if the RERC was required to quantifiably measure outcome variables that could be used for determining utilization outcomes for each product developed by the RERC. Such measures, according to the commenter, would be very useful to show policymakers the effectiveness of new approaches and devices.

Discussion: An applicant could propose to explore ways to incorporate mechanisms that would quantifiably measure outcome variables and the peer review process will evaluate the merits of the proposal. However, NIDRR has no basis to determine that all applicants should be required to propose to explore mechanisms that would quantifiably measure outcome variables.

Changes: None.

Priority 2: Wheelchair Transportation Safety

Comment: One commenter suggested that an activity should be added to this priority that addresses the transportation safety needs of manual wheelchair users who are capable of transferring onto a vehicle seat rather than having to be transported while seated in their wheelchair.

Discussion: NIDRR agrees that issues remain to be addressed with regard to wheelchair transportation safety. An applicant could propose to address the transportation safety needs of manual wheelchair users who transfer into vehicles and the peer review process will evaluate the merits of the proposal. However, NIDRR has no basis to determine that all applicants should be required to propose to explore transportation safety needs of manual wheelchair users who transfer into vehicles.

Changes: None.

Comment: Two commenters suggested that an activity should be added to the priority that specifically addresses the unique safety issues associated with wheelchair users who drive.

Discussion: NIDRR agrees with the commenters that issues remain to be addressed with regard to wheelchair transportation safety. An applicant could propose to address the unique safety issues of wheelchair users who drive and the peer review process will evaluate the merits of the proposal. However, NIDRR has no basis to determine that all applicants should be required to propose to address the unique safety issues of wheelchair users who drive.

Changes: None.

Comment: One commenter suggested the title of this priority be changed to better reflect the emphasis on wheelchair user transportation safety or broaden the scope to include the transportation safety needs of other groups of individuals with disabilities.

Discussion: NIDRR agrees with the commenter that the title of the RERC should be reworded to better reflect the emphasis on wheelchair users. NIDRR further agrees that there are many other disability groups (e.g., individuals who are visually, hearing, or cognitively impaired) who could benefit from an RERC that focused its research and development efforts on transportation safety needs. However, NIDRR feels that requiring this RERC to research the transportation safety needs for such a broad array of disability groups would require greater resources than have been allocated for this priority. Based upon the foregoing, an applicant could propose to address the transportation safety needs of wheelchair users who also have other disabilities and the peer review process will evaluate the merits of the proposal.

Changes: The title has been changed to the "RERC on Wheelchair Transportation Safety."

Comment: Two commenters suggested that the first activity should be expanded to require the RERC to gather additional information such as the cause of accident, the type of incident (i.e., normal driving maneuver, emergency maneuver, vehicle impact magnitude and direction), the cause of injury (i.e., wheelchair failure, securement or restraint failure, or improper securement), and the type of vehicle or transportation service involved (i.e., school bus, transit bus, paratransit, personal van).

Discussion: NIDRR agrees with the commenter that additional information about vehicle accidents involving wheelchair users would be beneficial and could ultimately lead to improvements in securement and vehicle adaptations.

Changes: The first activity has been modified to include "the cause of accident," "the cause of injury," and "the type of vehicle or transportation service involved."

Comment: A great deal of work has been done on independent securement that need not be repeated. What's needed is to build on the existing body of knowledge and incorporate advances made during the last decade in both wheelchair design and transit system vehicles.

Discussion: NIDRR agrees with the commenter and expects all applicants to be knowledgeable about the

methodology and literature of pertinent subject areas and to demonstrate an awareness of the state-of-the-art in technology.

Changes: None.

Comment: One commenter supported the development of integrated occupant restraint systems but feels it is important to require these efforts to be integrated with all wheelchair securement efforts, including the universal securement interfaces developed under the third activity.

Discussion: The fifth activity requires applicants to investigate integrated occupant restraint systems that are "independent of the vehicle." NIDRR believes that, in order to be independent of the vehicle, the integrated occupant restraint system must also be independent of wheelchair securement systems given that wheelchair securement systems are attached to vehicles. However, NIDRR does agree with the commenter's general concern that integrated occupant restraint systems developed by this RERC should not interfere with, or in any way compromise, the integrity of currently marketed wheelchair securement devices or those developed under the third activity.

Changes: None.

Comment: One commenter suggested that the third activity is too limiting in that it refers only to development of a universal securement interface that would enable users to safely and independently secure their wheelchairs and scooters. Other securement options need to be investigated that may be more feasible, more rapidly commercialized and more widely accepted while achieving the goal of being safer and easier to operate.

Discussion: NIDRR believes that the concept of a universal securement interface capable of being independently operated by most wheelchair users is an important concept that must be investigated. An applicant is free to propose to investigate other securement options and the peer review process will evaluate the merits of the proposal. However, NIDRR has no basis to determine that all applicants should be required to propose to investigate other securement options.

Changes: None.

Comment: Traditional dynamic testing is fairly straight forward but quite expensive given that it requires a test sled. Emphasis of the fourth activity should be on the development of lower cost tests, both static and dynamic, that are adequate to define the crashworthiness of wheelchairs as either acceptable or not acceptable. In

addition, this effort should include research to define the level of modification at which a wheelchair must be retested.

Discussion: NIDRR agrees with the commenter that it is important to investigate low-cost methods for testing the crashworthiness of wheelchairs and after-market and customized wheelchair seating systems and peripheral devices. NIDRR agrees that issues remain to be addressed with regard to wheelchair testing and retesting. An applicant could propose research to define the level of modification at which a wheelchair must be retested and the peer review process will evaluate the merits of the proposal. However, NIDRR has no basis to determine that all applicants should be required to propose research to define the level of modification at which a wheelchair must be retested.

Changes: The fourth activity has been modified to include “* * * methods, including low-cost methods, for testing, both static and dynamic, the crashworthiness * * *”.

Comment: Performance standards are an essential part of the process of implementing good securement and restraint practices on a wide scale. However, before starting work on new standards, the RERC should carefully study the response of manufacturers, transit agencies, and the public to the newly established standards on belt-type securement.

Discussion: The seventh activity requires the RERC to investigate the use of new or existing voluntary performance standards that would address problems associated with wheelchair-seated occupants. Development and implementation of new or existing voluntary performance standards are very time consuming and require input from a broad array of constituents, including those mentioned by the commenter.

Changes: None.

Comment: One commenter feels that the requirement for applicants to develop a plan for ensuring that all new and improved technologies are successfully transferred to the marketplace is a bit strong. The commenter went on to suggest that perhaps a better statement might be “* * * provide evidence that a good effort has been made to transfer * * *” and that levels of success in technology transfer should be clearly defined.

Discussion: Technology transfer is a critical activity that requires effort and planning. NIDRR believes that requiring all RERCs to develop a plan within the first year of the grant cycle promotes consideration of technology transfer

issues throughout the life of the grant. NIDRR does not believe that the requirement as stated is too “strong.”

Changes: None.

Comment: One commenter feels that the requirement for the RERC to conduct a state-of-the-science conference is one way to disseminate information but experience has shown it to be very limited in value. The commenter went on to suggest that an alternative might be to demonstrate active dissemination efforts (e.g., direct contact of user groups, regional meetings, e-mail publicity about a web-site as opposed to the passive approach of building a web-site that only curious people find, etc.).

Discussion: In addition to the mandatory state-of-the-science conference, applicants are required under the first bulleted activity of this priority to develop and implement a plan to disseminate the RERC research results to various constituents. NIDRR believes applicants should have the discretion to determine the best way to disseminate their information.

Changes: None.

Comment: Two commenters suggested that the priority be expanded to include all aspects of transportation safety for individuals with physical disabilities including the various modes of public and private transportation (e.g., roads, rails, air, and water) and high-risk activities such as boarding, exiting, and vehicle maneuvers.

Discussion: NIDRR agrees with the commenters that issues remain to be addressed with regard to other aspects of transportation safety for individuals with physical disabilities. However, NIDRR feels that requiring this RERC to research the transportation safety needs for all public and transportation modes as well as high-risk activities would require greater resources than have been allocated for this priority. An applicant could propose to address the transportation safety needs of individuals with physical disabilities in addition to those published in this priority and the peer review process will evaluate the merits of the proposal.

Changes: None.

Comment: One commenter believes that, before NIDRR establishes an activity investigating integrated occupant restraint systems, the relative merits of integrated restraints should be evaluated, considering their impact on non-travel activities, wheelchair design, compatibility with other required postural supports, and medical issues in addition to the biomechanics of crash safety.

Discussion: As noted in the background statement, there are numerous problems associated with

anchoring vehicle-mounted occupant restraint systems for wheelchair-seated occupants, thereby justifying NIDRR's requirement to investigate the concept of integrated occupant restraint systems that are independent of the vehicle.

Changes: None.

Comment: The terminology “use of new or existing standards” is unclear. There are incompatibilities between existing standards that need to be addressed without additional crashworthy requirements that may not be justified by injury data but would place undue burden on consumers, clinicians, and manufacturers.

Discussion: NIDRR's reference to “existing standards” in the seventh activity is based upon the background statement where two of voluntary performance standards (i.e., ANSI/RESNA WC-19 and SAE J2249) were discussed. These voluntary standards were developed by a diverse group, including researchers, manufacturers, relevant federal agencies, and consumers, as an attempt to improve transportation safety for wheelchair-seated travelers. NIDRR recognizes that there are some inconsistencies between these standards. NIDRR also recognizes the importance of obtaining quality injury and accident data of accidents involving wheelchair-seated travelers (see activity one). NIDRR believes that the required activities of this RERC will provide a solid foundation for research, development, testing, and information dissemination related to the development and implementation of voluntary standards aimed at improving transportation safety for wheelchair-seated travelers.

Changes: None.

Comment: The proposed priority did not make any distinction between children and adults, so we assume that both are to be included in RERC projects. In particular, there are special safety issues that are primarily related to children in wheelchairs that need to be addressed.

Discussion: The priority purposefully does not distinguish between children and adults. NIDRR agrees with the commenter that there are special safety issues related to children in wheelchairs (i.e., design requirements for restraints used with smaller children and the types of head support that are suitable and safe for use by children during transportation). An applicant could propose activities that focus specifically on children, adults, or both and the peer review process will evaluate the merits of the proposal.

Changes: None.

Comment: The detailed quantitative data on motor-vehicle crashes needed to

determine the incidence and extent of injuries to wheelchair-seated occupants in relation to the vehicle, occupant, restraint factors, and crash are not available, and will not be available for the foreseeable future. A code to identify wheelchair-seated occupants was recently added to the National Automotive Sampling System (NASS) data set, but because of the representative sampling strategy used in the NASS, it will be many years before this database provides a useful number of crashes involving wheelchair-seated occupants. What is needed now is a program that is aimed specifically at conducting in-depth investigations of as many motor-vehicle crashes involving wheelchair-seated occupants as possible in order to identify injury modes and risks that are unique to wheelchair-seated occupants in different types of crashes and to provide real-world feedback regarding the performance and effectiveness of equipment that complies with voluntary safety standards.

Discussion: An applicant could propose a program that is aimed specifically at conducting in-depth investigations of motor vehicle crashes involving wheelchair-seated occupants under the first activity and the peer review process will evaluate the merits of the proposal.

Changes: None.

Priority 3: Mobile Wireless Technologies for Persons With Disabilities

On April 18, 2001, we published a notice of proposed priority in the **Federal Register** (66 FR 20078). The Department of Education received 3 letters commenting on the notice of proposed priorities by the deadline date. Technical and other minor changes—and suggested changes we are not legally authorized to make under statutory authority—are not addressed.

Comment: An important outcome of an RERC is a body of objective knowledge that is archived for widespread use. The publication of results in peer reviewed literature that is appropriate for the constituencies of the center should be included as an option in the RERC's dissemination plan.

Discussion: NIDRR agrees with the commenter and supports the use of peer-reviewed journals as one means for disseminating RERC research results. NIDRR points out that the second bulleted activity does include "appropriate journals" as part of the dissemination plan requirement.

Changes: None.

Comment: The review process should include consideration of how the

applicant will conduct work that will promote long-term impact on the accessibility of wireless technologies after the conclusion of the grant.

Discussion: As the background statement suggests, the information technology field, including mobile wireless technologies, is evolving at such a high rate that it would virtually be impossible to determine the long-term impact on the accessibility of mobile wireless technologies after conclusion of this grant.

Changes: None.

Rehabilitation Engineering Research Center Program

The authority for RERCs is contained in section 204(b)(3) of the Rehabilitation Act of 1973, as amended (29 U.S.C. 764(b)(3)). The Assistant Secretary may make awards for up to 60 months through grants or cooperative agreements to public and private agencies and organizations, including institutions of higher education, Indian tribes, and tribal organizations, to conduct research, demonstration, and training activities regarding rehabilitation technology in order to enhance opportunities for meeting the needs of, and addressing the barriers confronted by, individuals with disabilities in all aspects of their lives. An RERC must be operated by or in collaboration with an institution of higher education or a nonprofit organization.

Description of Rehabilitation Engineering Research Centers

RERCs carry out research or demonstration activities by:

(a) Developing and disseminating innovative methods of applying advanced technology, scientific achievement, and psychological and social knowledge to (1) solve rehabilitation problems and remove environmental barriers, and (2) study new or emerging technologies, products, or environments;

(b) Demonstrating and disseminating (1) innovative models for the delivery of cost-effective rehabilitation technology services to rural and urban areas, and (2) other scientific research to assist in meeting the employment and independent living needs of individuals with severe disabilities; or

(c) Facilitating service delivery systems change through (1) the development, evaluation, and dissemination of consumer-responsive and individual and family-centered innovative models for the delivery to both rural and urban areas of innovative cost-effective rehabilitation technology services, and (2) other scientific

research to assist in meeting the employment and independent needs of individuals with severe disabilities.

Each RERC must provide training opportunities to individuals, including individuals with disabilities, to become researchers of rehabilitation technology and practitioners of rehabilitation technology in conjunction with institutions of higher education and nonprofit organizations.

The Department is particularly interested in ensuring that the expenditure of public funds is justified by the execution of intended activities and the advancement of knowledge and, thus, has built this accountability into the selection criteria. Not later than three years after the establishment of any RERC, NIDRR will conduct one or more reviews of the activities and achievements of the Center. In accordance with the provisions of 34 CFR 75.253(a), continued funding depends at all times on satisfactory performance and accomplishment.

Priority 1: RERC on Technology for Successful Aging

Background

Americans are living longer, and because of this demographic revolution the landscape of disability is also changing. Since 1900, average life expectancy has increased dramatically from less than 50 years of age to approximately 76 years, and centenarians now represent the fastest growing age group in the United States (Bureau of the Census, "Current Population Reports," pgs. 70–73, 1993). During this same time period, the percentage of Americans who are 65 years or older has more than tripled (from 4.1% in 1900 to 12.7% in 1999) and the actual number increased eleven times from 3.1 million to 34.5 million. This number is expected to double by the year 2030 (Administration on Aging, "Profile of Older Americans, 2000," <http://www.aoa.dhhs.gov/aoa/stats/profile/>).

In 1994–1995 more than half of those 65 and older (52.5%) reported having at least one disability and it is estimated that one-third of this population has a severe disability. Over 4.4 million (14%) have difficulty in carrying out activities of daily living (ADLs), which includes bathing, dressing, eating, and getting around the house, and 6.5 million (21%) reported difficulty in carrying out instrumental activities of daily living (IADLs) such as preparing of meals, shopping, managing money, using the telephone, doing housework, and taking medication. However, despite the increased risks of disability associated

with aging, ninety-five percent of older Americans choose to remain in their own homes, use public services and function independently as they age (Current Population Reports, "Americans with Disabilities, 1994–1995," <http://www.census.gov/main/cprs.html>).

Although there are many similarities between younger and older persons with disabilities (e.g., the goal of independent living), there are also important differences. Younger persons with disabilities are much more likely to experience impairment or disability in only one area (e.g., cognitive, hearing, vision, or mobility), whereas older persons tend to have multiple chronic conditions, presenting a mix of symptoms, impairments, and functional limitations. Older persons with disabilities also differ from their younger counterparts in that they are predominantly female, have lower income, and have a smaller network of social support.

As the baby boomer generation ages, the challenge for policymakers and industry is to fully leverage advances in information, communications, sensors, advanced materials, lighting, and many other technologies to optimize existing public and private investments and to create new environments that respond to an aging society's needs (Coughlin, J.F., "Technology Needs of Aging Boomers," *Issues in Science and Technology Online*: <http://bob.nap.edu/issues/16.1/coughlin.htm>, pg. 5, 1999). There is a need for an integrated infrastructure for independent aging that should include a safe home, a productive workplace, personal communications, and lifelong transportation.

The NIDRR Long-Range Plan suggests that aging of the disabled population in conjunction with quality of life issues dictates a particular focus on prevention and alleviation of secondary disabilities and coexisting conditions and on health maintenance over the lifespan. Research in this area must focus on the development and evaluation of environmental options in the built environment and the communications environment, including such approaches as universal design, modular design, and assistive technology that enable individuals with disabilities and society to select the most appropriate means to accommodate or alleviate limitations (NIDRR, Long-Range Plan: 1999–2003, pg. 49).

Home environmental interventions and assistive and universally designed technologies have the potential to increase independence for community-

based older persons with disabilities. A new generation of home-based monitoring and communication technologies could enable caregivers at any distance to monitor and respond to the needs of older friends, family, residents, and patients. Systems that make full use of the existing telecommunications infrastructure could be used to ensure that medicine has been taken, that physical functions are normal, and that minor symptoms are not indicators of a larger problem. They could provide early identification of problems that, if left untreated, may result in hospitalization for the individual and higher health care costs to society (Coughlin, J.F., op cit., pg. 7, 1999).

The fact that most older adults choose to remain in their own homes as they age is a cost effective option from a public policy perspective provided that the home can be used as a platform to ensure overall wellness and community integration. For example, introduction of a new generation of appliances, health monitors, and related devices that can safely support independence and remote caregiving could make the home a viable alternative to long-term care for many older adults. Research should go beyond questions of design and physical accessibility to the development of an integrated home that is attractive to us when we are younger and supportive of us as we age (Coughlin, J.F., op cit., pg. 6, 1999).

In the emerging, evolving field of assistive technology, there are gaps in the research. This is particularly true for older adults with disabilities. To create enabling home environments, research is needed on assistive and universally designed technologies and environmental interventions that are safe, affordable, support independence and social participation, and involve the integration of information technology and ergonomic principles. As part of achieving this goal, there is a need to develop appropriate devices that unobtrusively monitor key needs (*i.e.*, taking medications, eating, and drinking), as well as critical events (*i.e.*, falls or stove left on). There is also a need for research to determine the most effective ways to inform professionals, families, and consumers about new and emerging assistive and universally designed technologies, the best ways to use them, and ways to pay for them.

Another important area relates to the needs of older persons with cognitive impairments. This population presents the greatest challenge to creating enabling environments. According to recent findings, individuals with cognitive impairment use the fewest

numbers of assistive devices but could benefit from the development of "smart" environments—devices that anticipate needs, suggest (or actually provide) alternatives, and limit the amount of sensory input and decision making required (Mann, W., *Topics in Geriatric Rehabilitation 8(2)*, pgs. 35–52, 1993).

Priority

We will establish an RERC on technologies for successful aging that will focus on technological solutions to promote the health, safety, independence, active engagement and quality of life of older persons with disabilities. The RERC must:

(a) Identify, assess, and evaluate current and emerging needs, and barriers to meeting those needs, for home-based monitoring and communication technologies that promote health, independence, and active engagement of older persons with disabilities in the community and with family and friends;

(b) Investigate, develop, and evaluate home-based monitoring and communication technologies to promote health independence, and active engagement of older persons with disabilities;

(c) Investigate, develop, and evaluate technologies that can be used to create "smart" environments that anticipate needs, suggest (or actually provide) alternatives, and limit the amount of sensory input and decision making required of older persons with multiple types of impairments, including sensory, mobility, and cognitive;

(d) Identify, develop and evaluate strategies and training materials to promote knowledge about new and existing technologies for use by caregivers, home health and other service providers, case managers and by older persons with disabilities; and

(e) Develop and explore various strategies for strengthening partnerships with industry to facilitate the development of new technologies and applications that are appropriate for use by older persons with multiple types of impairments and functional capabilities.

In addition to activities proposed by the applicant to carry out these purposes, the RERC must:

- Develop and implement in the first year of the grant, and in consultation with the NIDRR-funded National Center for the Dissemination of Disability Research (NCDDR), a plan to disseminate the RERC's research results to all relevant target audiences including, but not limited to, clinicians, engineers, manufacturers, service providers, older persons with

disabilities, families, disability organizations, technology service providers, case managers, businesses, and appropriate journals;

- Develop and implement in the first year of the grant, and in consultation with the NIDRR-funded RERC on Technology Transfer, a utilization plan for ensuring that all new and improved technologies developed by this RERC are successfully transferred to the marketplace;
- Conduct in the third year of the grant a state-of-the-science conference on home-based monitoring and communication technologies to promote the health, independence, and active engagement of older persons with disabilities and publish a comprehensive report on the final outcomes of the conference in the fourth year of the grant; and
- Collaborate on research projects of mutual interest with NIDRR-funded projects, such as the RERCs on Universal Design and the Built Environment, Mobile Wireless Technologies, Information Technology Access, Telecommunications Access, Telerehabilitation, the RRTC on Aging with a Disability, and Assistive Technology Act projects as identified through consultation with the NIDRR project officer.

Priority 2: RERC on Wheelchair Transportation Safety

Background

Americans live in a very mobile society where access to, and use of, public and private transportation services is essential to daily living. There are roughly 1.7 million Americans living outside of institutions who use wheelchairs and scooters (Kaye, H.S., Kang, T., and LaPlante, M.P., "Mobility Device Use in the United States," *Disability Statistics Report, (14)*, Washington, D.C.: U.S. Department of Education, NIDRR, June, 2000), including those who rely heavily on public and private transportation services to commute to work and school, participate in recreational activities, and carry out daily activities. The Individuals with Disabilities Education Act (IDEA) requires that children with disabilities, including those who use wheelchairs, must be transported safely to educational settings. The Americans with Disabilities Act of 1990 (ADA) requires that all public and private transportation systems, including trains, buses, and subways be accessible to persons with disabilities, including those who use wheelchairs. (The ADA does not address air transportation and

school buses.) However, in a recent report eighty-two percent of wheelchair users stated they have difficulty accessing their local public transportation system (Kaye, H.S., Kang, T., and LaPlante, M.P., "Mobility Device Use in the United States." *Disability Statistics Report, (14)*, Washington, D.C.: U.S. Department of Education, NIDRR, June, 2000).

Many wheelchair users are not capable of transferring into a vehicle seat and instead are required to travel seated while in their wheelchairs. However, most wheelchairs are not designed to function as vehicle seats, thus putting wheelchair-seated travelers at greater risk of injury compared to those who sit in standard vehicle seats (Bertocci, G.E., et. al., "Computer Simulation and Sled Test Validation of a Powerbase Wheelchair and Occupant Subjected to Frontal Crash Conditions," *IEEE Transactions on Rehabilitation Engineering*, Vol. 7, No. 2, pg. 234, June, 1999). Providing effective occupant protection in a motor vehicle is a multifaceted problem that involves the vehicle seat, how the seat is anchored to the vehicle, and an occupant restraint system (seatbelts, airbags, etc). Manufacturers of motor vehicle seats are required to perform extensive testing to ensure that vehicle seating systems are designed and constructed to provide support for the occupant under crash conditions (Department of Transportation, U.S. National Center for Health Statistics, "Federal Motor Vehicle Safety Standards Seating Systems," U.S. Government Printing Office, Washington, DC, 49 CFR 571.207). However, wheelchairs used as motor vehicle seats are not necessarily designed for such use and must rely upon after-market products to secure or anchor the wheelchair to the vehicle. Unfortunately, tie-down systems are not afforded the same scrutiny as vehicle seating systems thereby increasing the likelihood that the tie-down systems could fail and the wheelchair and its occupant could become a projectile in crash settings.

Laboratory research has dramatically demonstrated the potential danger for wheelchair riders not adequately secured using wheelchair tie-down and restraint systems (WTORS) during vehicle collisions (Benson, J.B. and Schneider, L.W., "Improving the crashworthiness of restraints for handicapped children," In: *Advances in belt restraint systems, design, performance, and usage: Society of Automobile Engineers Technical Paper #840528*, Warrendale, PA., pgs. 389-404, 1984). Although there has been an increased awareness about wheelchair

rider safety, there is a paucity of information regarding the risk to wheelchair riders while riding in motor vehicles. In an effort to better characterize wheelchair rider risk, an analysis of motor vehicle accident data for the general public was conducted. According to Shaw, the most readily accessible and quantifiable information regarding vehicle accidents involving onboard wheelchairs was found in the National Electronic Injury Surveillance System (NEISS) database that is maintained by the Consumer Product Safety Commission (CPSC). CPSC staff collected information from a sample of 95 (out of an estimated 6,000) hospitals nationwide that are equipped to accommodate emergency visits. Based upon data collected from January 1988 through September 1996, an estimated 1,320 wheelchair riders were injured as a result of vehicle accidents (Shaw, G., "Wheelchair rider risk in motor vehicles: A technical note," *Journal of Rehabilitation Research and Development*, Vol. 37, No. 1, Pgs. 89-100, January and February, 2000).

Similar results were found in a different study that looked at NEISS data from 1986 to 1990. In that study, an estimated 2,200 wheelchair riders were injured and the author concluded that "improper securement accidents generally occur when the vehicle stops too quickly or makes a sharp turn." Furthermore, the author could only find the record of one fatality between 1973 and 1991 that resulted from an occupant falling from the wheelchair due to a sudden stop (Richardson, H.A., "Wheelchair occupants injured in motor vehicle-related accidents," U.S. Department of Transportation National Center for Statistics and Analysis, Mathematical Analysis Division, Washington, DC 1991).

Both studies expressed the need for caution when using NEISS data to define wheelchair rider injury risk. Although the NEISS data source provides a perspective regarding the approximate number of incidents and insight as to the kinds of injury-producing situations, it does not provide sufficient specific detail such as a consistent reporting and classification of vehicle type and size (i.e., large, heavy vehicles versus small, lighter vehicles), the WTORS used, and the death and injury rate per unit of exposure. This information is needed to establish the risk and to evaluate the efficiency of risk-reduction efforts (Shaw, G., op cit., 2000).

Voluntary standards have been developed to establish general design and performance requirements for wheelchairs intended to also be used as

a vehicle seat and for WTORS. The American National Standards Institute/Rehabilitation Engineering Society of North America (ANSI/RESNA) wheelchair standard (hereafter referred to as ANSI/RESNA WC-19) provides wheelchair manufacturers with design and testing guidelines under frontal impact conditions for wheelchairs intended to be used as seats in motor vehicles (American National Standards Institute (ANSI)/Rehabilitation Engineering Society of North America (RESNA), "WC/Volume 1, Section 19: Wheelchairs used as seats in motor vehicles," RESNA standard, Arlington, VA: RESNA, 2000). Similarly, a standard developed by the Society of Automotive Engineers (SAE J2249) provides guidance for the installation and usage of WTORS (SAE, "SAE J2249: Wheelchair tie-downs and occupant restraints systems for use in motor vehicles," Society of Automotive Engineers (SAE), 1996).

Although these voluntary standards address the safety needs of wheelchair-seated travelers, there is still much that needs to be accomplished. For instance, the ANSI/RESNA WC-19 standards are used to assess the crashworthiness of complete wheelchair systems through a variety of tests including dynamic frontal impact testing. However, there are no requirements to test the crashworthiness of wheelchair systems under varying impact directions, such as side or rear impact crashes. Studies of both the biomechanics and kinematics of occupants and wheelchairs subjected to side and rear impact crashes could lead to a better understanding of injury risk for wheelchair-seated occupants under these circumstances and improved design criteria and safety standards.

The SAE J2249 standards recommend using four-point, strap-type wheelchair tie-downs for securing wheelchairs to a vehicle. Devices such as these have been used for some time and are effective if the chair is designed to accommodate the strains and is secured properly. However, strap-type tie-downs are cumbersome and time-consuming, warranting the need for development of wheelchair tie-downs that are both safe and easy to operate.

Finally, it is not uncommon for rehabilitation technology professionals to order a wheelchair frame or base from one supplier and add to it a separate seating system or other peripheral device, such as a ventilator, that has been purchased from another supplier. Despite an effort to evaluate the crashworthiness of a wheelchair system using the ANSI/RESNA WC-19 standards, the common practice of

adding after-market or customized equipment invalidates the test results of a wheelchair tested with originally manufactured components. Subsequently, the after-market or customized equipment are not subjected to the same dynamic impact testing used on the original wheelchair system to evaluate its ability to withstand crash-level forces (Van Roosmalen, L., et. al., "Proposed Test Method for and Evaluation of Wheelchair Seating System (WCSS) Crashworthiness," *Journal of Rehabilitation Research and Development*, Vol. 37, No. 5, Pgs. 543-553, September and October, 2000).

Perhaps one of the most successful safety devices introduced by the automobile industry is the safety belt, or occupant restraint system. It is estimated that safety belts save 9,500 lives every year (National Highway Traffic Safety Administration, "America's Experience with Seat Belt and Child Seat Use," January 2, 2001: www.nhtsa.dot.gov/people/injury/airbags/presbelt/america_seatbelt.html) and many States now make it mandatory for occupants riding in private vehicles to wear safety belts. Traditional vehicle seating systems protect their occupants through properly positioned occupant restraint systems and crashworthy seat design (Department of Transportation, U.S. National Center for Health Statistics, "Federal Motor Vehicle Safety Standards Seating Systems," U.S. Government Printing Office, Washington, DC, 49 CFR 571.207). Unfortunately, individuals who must remain seated in their wheelchairs while traveling in motor vehicles are unable to benefit from traditional seating systems. According to the SAE J2249 standards, the current practice for wheelchair-seated occupant pelvic restraints (lap belts) is to anchor the belts to the vehicle floor or to rear wheelchair tie-downs. Current practice for the shoulder restraint is to anchor one end of the belt on the vehicle wall or ceiling and the lower end to the pelvic restraint belt (Society of Automotive Engineers, "SAE J2249: Wheelchair tie-downs and occupant restraints (WTORS) for use in motor vehicles," 1996). ANSI/RESNA WC-19 recommends an additional wheelchair integrated pelvic restraint on wheelchairs that are used in motor vehicles (American National Standards Institute (ANSI)/Rehabilitation Engineering Society of North America (RESNA), "WC/ Volume 1, Section 19: Wheelchairs used as seats in motor vehicles," RESNA Standard, Arlington, VA: RESNA, 2000). However, there are

numerous problems associated with anchoring vehicle-mounted occupant restraint systems for wheelchair-seated occupants including, but not limited to, the limited number of anchoring options due to window locations, seating positions, and the vehicle's structural integrity. In addition, all users, regardless of wheelchair models, seat heights, etc., are required to use the same fixed occupant restraint systems that have the potential of compromising safety belt fit, comfort, and occupant safety.

Priority

We will establish an RERC on transportation to improve the safety of wheelchair users who remain seated in their wheelchairs while using public and private transportation services and to investigate new wheelchair securement technologies that might enable wheelchair users to independently secure and release the wheelchair without the need for a second person. The RERC must:

(a) Investigate and report on the incidence, extent, and nature of injury of wheelchair riders due to motor vehicle accidents, making a distinction between the cause of accident, the cause of injury, the type of vehicle or transportation service involved, and the vehicle size and weight, and include recommendations for ways to minimize injury;

(b) Investigate and report on safety issues, including both kinematics and biomechanics, related to wheelchair-seated occupants subjected to side and rear impact crashes;

(a) Investigate, develop and evaluate universal securement interfaces that would enable wheelchair and scooter users to safely and independently secure their wheelchairs and scooters to motor vehicles;

(b) Investigate and compare methods, including low-cost methods, for testing, both static and dynamic, the crashworthiness of after-market and customized wheelchair seating systems and peripheral devices and, if found to be viable, develop strategies for integrating these methods into existing voluntary wheelchair performance standards;

(e) Investigate, develop, and evaluate integrated occupant restraint systems that are independent of the vehicle and easy for wheelchair-seated occupants to operate; and

(f) Investigate the use of new or existing voluntary performance standards that would address problems associated with wheelchair-seated occupants subjected to side and rear impact crashes and potential benefits of

using integrated occupant restraint systems, universal securement interfaces, and after-market and customized wheelchair seating systems and peripheral devices.

In addition to the activities proposed by the applicant to carry out the purposes, the RERC must:

- Develop and implement in the first year of the grant, and in consultation with the NIDRR-funded National Center for the Dissemination of Disability Research (NCDDR), a plan to disseminate the RERC's research results to clinicians, engineers, manufacturers, persons with disabilities, disability organizations, technology service providers, businesses, and appropriate journals;
- Develop and implement in the first year, and in consultation with the NIDRR-funded RERC on Technology Transfer, a utilization plan for ensuring that all new and improved technologies developed by this RERC are successfully transferred to the marketplace;
- Conduct in the third year of the grant a state-of-the-science conference on wheelchair transportation and publish a comprehensive report on the final outcomes of the conference in the fourth year of the grant;
- Collaborate on research projects of mutual interest with other projects, such as the NIDRR-funded RERC on Wheeled Mobility and the Federal Transit Administration-funded Project Action, as identified through consultation with the NIDRR project officer; and
- Collaborate with relevant Federal agencies responsible for the administration of public laws that address access to and usability of public and private transportation for individuals with disabilities including, but not limited to, the U.S. Department of Transportation's Federal Transit Administration and National Highway Traffic Safety Administration, and other relevant Federal agencies identified by the NIDRR project officer.

Priority 3: RERC on Mobile Wireless Technologies for Persons With Disabilities

Background

The information technology (IT) revolution is fundamentally altering the way Americans work, purchase goods and services, communicate, and play. Today, one can access information using any number of electronic devices and networks, including computers connected to "plain old telephone lines" (POTS), televisions connected to cable or digital satellite networks, cellular telephones, or wireless hand-held personal digital assistant devices.

Unlike earlier information technologies (*i.e.*, print, radio, telephone, television and telefax), mobile communications networks, the Internet and the World Wide Web did not enter into our daily lives gradually—rather, they exploded onto the scene. While the economic impact of this transformation has not been fully evaluated at either the individual or systems level, it is significant.

The proliferation of information technologies, including wireless technologies, does not guarantee accessibility for persons with disabilities. According to a recent study, only 23.9% of people with disabilities have access to a computer at home compared to just over half (51.7%) of their non-disabled counterparts. The gap in Internet use is even more striking: roughly 10% of people with disabilities connect to the Internet compared to almost 40% of those without disabilities. Elderly people with disabilities are even less likely to make use of these technologies. Among those 65 years of age or older, only 10% of individuals with disabilities have computers at home and, of those, only 2.2% use the Internet (Kaye, H.S., "Computer and Internet Use Among People with Disabilities," *Disability Statistics Report (14)*, U.S. Department of Education, National Institute on Disability and Rehabilitation Research, Washington, D.C., 1999).

Chapter 5 of NIDRR's Long-Range Plan (64 FR 45768) discusses the importance of making information technology accessible to persons with disabilities of all ages, and includes a discussion of universal access and the need for continued research and development in this area. Unfortunately, while advances in computers and information technologies create new opportunities for some individuals, they create barriers for others. The proliferation of electronic visual and tactile displays (*i.e.*, LCD, LED, and touch screens) on home appliances, business equipment, and public access terminals also poses a major problem for individuals with sensory and motor deficits unless alternative methods for accessing and using these devices are made available. Conversely, audio cues (beeps) cannot convey information to individuals who are deaf or hard of hearing. Of particular concern is that an increasing number of functions are being integrated onto single chips or motherboards, obviating the need for third party accessories such as sound cards or voice input devices. This makes changes or modifications to these built-in features difficult or even impossible.

Cellular communications are wireless communications that occur in small "cells" or geographic areas on land. When one talks on a cellular phone their voice is transmitted to a nearby tower (usually within ten miles). Cellular phone calls are then passed from tower to tower as cellular users move from one geographic area to the next. To manage all the communications, the cellular phones and towers must "speak" the same language. The Internet and World Wide Web revolutions began in the 1990's and, in less than a decade, have been responsible for reshaping the way information is accessed and the way commerce is conducted (Hjelm, J., *Designing Wireless Information Services*, Wiley Computer Publishing, New York, pg. 2, 2000).

Technologies that launched the digital revolution are undergoing rapid changes, resulting in a new generation of mobile information systems. The Wireless Application Protocol (WAP) was developed in 1997 by numerous wireless companies in an attempt to make a common interface for wireless devices to access the Internet (Hjelm, J., *op cit.*, pg. 293, 2000). This standard is currently being implemented into cellular phones and personal digital assistants and includes the technology to transmit data back and forth using "micro-browsers." Micro-browsers are analogous to Internet browsers used on personal computers but have far fewer features so only the most relevant information is communicated using WAP (Mock, D.L., "Wireless 101: A Guide to Wireless Investing for Newbies and non-Techies," *Rev. 2*, pgs. 13-14, July, 2000). A new technology that is poised to revolutionize the IT industry is the Bluetooth Protocol Architecture, the name given to a new short-range radio frequency technology that could ultimately replace data wire connections on just about any electronic device. Bluetooth technologies will enable electronic devices within about 30 feet of each other to communicate over a high-speed wireless connection and could transcend any environment (Hjelm, J., *op cit.*, pg. 292, 2000).

The future generation of wireless technologies, commonly referred to as "third generation" systems, will ultimately have the capacity to transmit data, text, voice, and graphics between terminals that may be fixed or moving, with bandwidth that varies according to the instant demand and is charged for on that basis (Shipley, T. and Gill, J., "Inclusive Design of Wireless Systems," Royal National Institute for the Blind, London, England, pg. 27, 2000). Third generation systems will provide Internet

access as well as point-to-point communication, and will ultimately merge with other wireless technologies, such as Bluetooth (Ibid).

The ubiquitous nature of mobile wireless communications brings with it a host of opportunities as well as challenges. For example, a cellular telephone cannot present information in the same way that a laptop or desktop can. Furthermore, different environments require different types of input and output. It is difficult to use a keyboard when walking, difficult and even dangerous to use a device that requires visual attention when driving, and devices that require speech input or output are not practical in noisy environments.

People with disabilities should be able to benefit from the evolving digital revolution on equal terms, freed from the barriers of inaccessible technology (Ibid, pg. 27). This will happen only if the new wave of wireless communications systems are designed to accommodate a broad range of abilities among users (Ibid, pg. 2). Without an inclusive approach to design, large segments of this target population will find themselves precluded from accessing and participating in the new information driven society (Ibid). The infrastructure to support the new era of wireless technologies will be complex and expensive, and because of this there will be reluctance to make changes once systems are operational. Therefore, it is imperative that the design of both systems and equipment be considered carefully at the outset of development.

Further, there is a critical shortage of engineers and product designers who are capable of providing expertise to developers and manufacturers about incorporating accessible and universal design features into their IT products. Achieving this goal will require product designers and IT experts to collaborate more closely with clinicians, service providers, and consumers to identify potential applications of new telecommunications devices and systems that support independent living, employment, and community integration. Finally, more individuals need to be trained to educate consumers, customer service professionals, technical writers, web developers, marketers, and other IT related professionals about accessible and usable information technologies.

NIDRR currently funds RERCs on Information Technology Access and Telecommunications Access. The RERC on Mobile Wireless Technologies for Persons with Disabilities will be required to coordinate with these two

RERCs on relevant policy and regulatory activities and other activities of mutual interest.

Priority

We will establish an RERC on mobile wireless technologies to investigate promising applications of, and facilitate equitable access to, future generations of mobile wireless technologies for individuals with disabilities of all ages and to expand research and development capacity within this subject area. The RERC must:

(a) Investigate, develop, and evaluate technological solutions in collaboration with industry to promote universal access and usability in future generations of mobile wireless technologies;

(b) Investigate, develop, and evaluate applications of mobile wireless technologies that could benefit persons with disabilities in independent living, employment, and community integration such as healthcare monitoring, environmental control, emergency location signaling devices, scheduling maintenance, mobile communications, etc.;

(c) Investigate, develop, and evaluate innovative and flexible multi-modal interface methods for accessing and using future generations of mobile wireless technologies such as home appliances, mobile communication systems and portable information terminals, office equipment, health-monitoring devices, and public access terminals;

(d) Identify, implement, and evaluate, in collaboration with the wireless IT industry, professional IT associations, and institutions of higher education, innovative approaches to expand capacity in accessible IT studies including design, research and development;

(e) Monitor trends and evolving product concepts that represent and signify future directions for mobile wireless technologies; and

(f) Provide technical assistance to public and private organizations responsible for developing policies, guidelines and standards that affect the accessibility of mobile wireless technologies and systems that are manufactured and implemented.

In addition to the activities proposed by the applicant to carry out these purposes, the RERC must:

- Collaborate with industry, industrial consortia, and professional and trade associations on all activities;
- Develop and implement in the first year of the grant, and in consultation with the NIDRR-funded National Center for the Dissemination of Disability

Research (NCDDR), a plan to disseminate the RERC's research results to disability organizations, persons with disabilities, technology service providers, businesses, manufacturers, and appropriate journals;

- Develop and implement in the first year of the grant, and in consultation with the NIDRR-funded RERC on Technology Transfer, a utilization plan for ensuring that all new and improved technologies developed by this RERC are successfully transferred to the marketplace;

- Conduct a state-of-the-science conference on accessible information technologies in the third year of the grant cycle and publish a comprehensive report on the final outcomes of the conference in the fourth year of the grant cycle; and

- Coordinate on research projects of mutual interest with relevant NIDRR-funded projects such as the RERCs on Information Technology Access and Telecommunications Access and the Information Technology Technical Assistance and Training Center, as identified through consultation with the NIDRR project officer.

Applicable Program Regulations: 34 CFR part 350.

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(Catalog of Federal Domestic Assistance Numbers 84.133E, Rehabilitation Engineering Research Center) Program Authority: 29 U.S.C. 762(g) and 764.

Dated: June 12, 2001.

Francis V. Corrigan,

Deputy Director, National Institute on Disability and Rehabilitation Research.

[FR Doc. 01-15154 Filed 6-14-01; 8:45 am]

BILLING CODE 4000-01-P