

2005
Annual Report

NATIONAL ACADEMY OF ENGINEERING



ENGINEERING THE FUTURE

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Letter from the President

The enormous prosperity of the United States is due in no small measure to the innovative contributions of engineers. However, in the process of developing the very technologies that have made us prosperous, we have enabled others to compete with us on a more level playing field. In general, this is a good thing, because a rising tide lifts all ships, and a more prosperous world will surely be a safer world. But the strategies that helped us get to the top are not the ones that will lead to greater security, prosperity, and health in the future. As difficult and uncomfortable as change may be, we must change the things we can control or influence—and we must begin now, before it is too late.



Wm. A. Wulf

In a world where widespread advanced knowledge and readily available low-cost labor are undermining U.S. advantages in the marketplace and eroding U.S. leadership in science and technology, we urgently need a comprehensive, coordinated federal effort to bolster our competitiveness and preeminence. Two reports produced in 2005, *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future* and *Engineering Research and America's Future: Meeting the Challenges of a Global Economy*, focus on what we as a nation must do to prosper in the globalized, competitive 21st century. Both reports have already gained some “traction” in Congress and the executive branch.

The congressionally requested NRC report, *Rising Above the Gathering Storm*, makes four recommendations and identifies 20 implementation actions for federal policy makers that will lead to the creation of high-quality jobs and focus science and technology efforts on meeting the nation's needs, especially in the area of clean, affordable energy. The report recommends: (1) increasing the U.S. talent pool by vastly improving K–12 mathematics and science education; (2) strengthening the commitment to long-term basic research; (3) developing, recruiting, and retaining top students, scientists, and engineers from the U.S. and abroad; and (4) ensuring that the United States is the premier place in the world for innovation. Implementing some of these actions will require changing existing laws. All of them will require financial support that could be made available by reallocating existing budgets and increasing them, when necessary.

Engineering Research and America's Future, an NAE report, describes the critical role of engineering research in maintaining U.S. technological leadership, documents major challenges and opportunities facing the U.S. engineering research enterprise, and offers specific recommendations for leaders in federal and state government, industry, and universities for strengthening U.S. engineering research in the face of intensifying global competition.

A joint study by NAE and the Institute of Medicine, *Building a Better Delivery System: A New Engineering/Health Care Partnership*, includes findings and recommendations for building a strong partnership between engineers and health care professionals to address the crises facing the health care delivery system in the United States. The report also includes an extended discussion of how systems engineering tools might be used to improve the quality of care and the efficiency of care delivery.

Another NAE report, *The Engineer of 2020: Adapting Engineering Education to the New Century*, provides recommendations for engineering educators, employers, professional societies, and government agencies engaged in reengineering the “system of systems”—engineering education. Engineers of the future must be educated to perform in a multicultural, multiethnic, global environment.

In 2005, the Grainger Challenge Prize for Sustainable Development was established to encourage the development of a small-scale, inexpensive system for removing arsenic from contaminated groundwater, a problem that affects tens of millions of people, especially in developing countries. The purpose of the prize is ultimately to make a material difference in achieving a sustainable future for people everywhere. The Grainger Challenge Prize will be awarded in 2007.

The projects I have cited here represent just a sampling of the work done by NAE in 2005. The following pages will provide more insight into the broad scope of our activities. We remain committed to promoting the technological welfare of the nation and grateful for the support of our members and friends, whose generous financial contributions make it possible for NAE to continue making meaningful contributions to the well-being of the nation. Thank you.



Wm. A. Wulf
President

In Service to the Nation

Every day our nation faces questions related to engineering and technology. How can we keep our nation safe from terrorism? How can we increase diversity in the engineering workforce? What role should citizens play in decisions about technology development? How can we help journalists and others in the media provide accurate, timely engineering and technology information? Answering these questions is becoming increasingly difficult as we advance technologically and become more involved in the global community.

Since 1964, the National Academy of Engineering (NAE) has provided independent, objective advice to the nation on engineering-related topics and policies. NAE operates under the same congressional act of incorporation that established the National Academy of Sciences, signed in 1863 by President Abraham Lincoln. Under this charter, NAE is directed “whenever called upon by any department or agency of the government, to investigate, examine, experiment, and report upon any subject of science or art.”

NAE has more than 2,000 peer-elected members and foreign associates, approximately 47 percent from academia, 45 percent from industry, and 8 percent from nonprofit institutions and government. NAE members are drawn from bioengineering, computer science, aerospace, civil engineering, industrial engineering, and mechanical engineering. They serve as members of research and study committees, plan and conduct symposia and workshops, and assist in the work of the organization in many other ways. Areas of focus include working collaboratively at home and abroad to identify and solve technological problems, assessing the technological needs of the nation and sponsoring programs to meet those needs, advising Congress and government agencies on engineering-related matters of national importance, and recognizing and honoring outstanding engineers for their contributions to the well-being of the nation and the world.

NAE not only responds to requests from government, but also sponsors activities with foundations, industry, and state and local governments and funds projects through endowment funds supported by private contributions. Thus, NAE is a unique organization that brings together distinguished engineers for the purpose of improving the lives of people everywhere.

NAE is a member of the National Academies, which also include the National Academy of Sciences, Institute of Medicine, and National Research Council.

Mission Statement

To promote the technological welfare of the nation by marshalling the knowledge and insights of eminent members of the engineering profession.

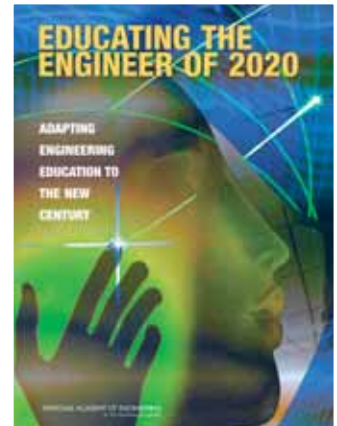
PROGRAM REPORTS

Engineering Education

The Committee on Engineering Education (CEE), a standing committee of the National Academy of Engineering Office of the President, is a select group of thought leaders and experts from the business, academic, and public sectors with a demonstrated commitment to the advancement of engineering education. The mission of CEE is to provide guidance and advice to policy makers, administrators, employers, and others to ensure quality, diversity, and quantity in engineering education. The CEE was chaired by Stephen Director (NAE) of Drexel University until July, 2005 and by Michael Corradini (NAE) of the University of Wisconsin from July, 2005 forward.

In 2005, CEE released *Educating the Engineer of 2020: Adapting Engineering Education to the New Century*, the second report of the Engineer of 2020 Project. The study committee was chaired by Wayne Clough (NAE) of Georgia Institute of Technology.

Although the basics of engineering will not change in the future, the explosion of knowledge, the global economy, and ongoing technological evolution will change the way future engineers practice their profession. Changes in engineering education must be considered in the broad context of enhancing the status of the engineering profession and improving the public understanding of engineering. This new report offers recommendations for enriching and broadening engineering education to ensure that graduates are prepared to work in a constantly changing global economy. Recommendations address ways to improve the recruitment and retention of students and make the learning experience more meaningful to students from diverse backgrounds.



Like the first report in 2004, *Educating the Engineer of 2020* received an enthusiastic reception. Nearly 2,000 copies were sold in the first several months. In addition, the report has been the subject of several presentations at national conferences and a main topic of discussion at the “Engineering Education Leadership Institute” hosted by the NAE Center for the Advancement of Scholarship in Engineering Education.

The technical symposium at the 2005 NAE Annual Meeting, which was organized by CEE, was focused on what has been learned thus far in the Engineer of 2020 Project. Presentations by Charles M. Vest (NAE), George Peterson, Theodore Kennedy (NAE), Jacquelyn Sullivan, and Susan Ambrose focused on challenges and opportunities in engineering education; the impact of ABET EC2000 criteria on student learning; necessary skills and abilities of entry-level engineers; a systems approach to increasing diversity in engineering education; and the development of teaching skills by engineering faculty.

Center for the Advancement of Scholarship on Engineering Education

The goal of the Center for the Advancement of Scholarship on Engineering Education (CASEE) is to make engineering education more valuable from the perspective of employers, graduate schools, students, and society as a whole. CASEE works collaboratively with diverse elements in the engineering community to leverage opportunities for continuous, significant improvements in engineering education.

In 2005, NAE extended the appointments of three Engineering Education Senior Fellows to work on two projects on increasing diversity in the engineering workforce. The goal of the first project is to improve the understanding of engineering principles among non-engineering university students. The focus of the second project is to document diversity in international perceptions of engineering and prepare domestic students to work in a global environment.

In October 2005, CASEE held the second Dane and Mary Louise Miller Symposium, a showcase for innovative activities in research and development on engineering education. The symposium is an affiliated activity of the Frontiers in Education Conference sponsored by the Institute of Electrical and Electronic Engineers and the American Society for Engineering Education. At the symposium, CASEE released the second volume of *CASEE Chronicles*, an update on progress by CASEE's 40 organizational affiliates.

CASEE currently has external support for eight projects focused on community building, advancing knowledge of effective educational practices, and disseminating that knowledge in the engineering community. Sponsored grants received in 2005, most of them for multiyear projects, exceeded \$2.8 million.



Technological Literacy

The purpose of the Program on Technological Literacy is to explore how Americans can become better prepared to navigate our technology-dependent society. What should citizens—adults and children—understand about technology? What is the role of individuals in helping decide which technologies are developed and for what purposes? What sorts of changes should be made in formal and informal education and in the policy arena to equip citizens to participate in technology-related decisions?

Now in its eighth year, the program has contributed to the development of standards for the study of technology in elementary and secondary schools; conducted a variety of outreach activities to educators, policy makers, and the general public; sponsored a number of informational workshops; and overseen two consensus studies. The program's most visible published work is the 2002 report, *Technically Speaking: Why All Americans Need to Know More About Technology*. The report makes a strong case for technological literacy and is accompanied by a companion website, <www.nae.edu/techlit>.



In 2005, NAE completed work on a study funded by the National Science Foundation on approaches to assessing technological literacy. The lack of reliable information about what people know and can do with respect to technology is a major impediment to gauging the effectiveness of interventions intended to increase technological understanding. The report, which is scheduled to be published in summer 2006, was put together by the Committee on Assessing Technological Literacy, a group of 16 carefully selected experts chaired by Elsa M. Garmire (NAE), Dartmouth College. The project is being carried out in collaboration with the NRC Board on Testing and Assessment.

Public Understanding of Engineering

NAE continues to strengthen its relationships with media, government, community organizations, and individuals to help decision makers and members of the general public gain a better understanding of engineering and how it contributes to our quality of life. As NAE's visibility increases, new opportunities are created to participate in important activities.

Media Relations

In 2005, five workshops (in addition to the five held in 2004) featuring terrorism scenario exercises were conducted for journalists, government officials, and the engineering and science communities. The workshops were held in cities across the country as part of the NAE project, News and Terrorism: Communicating in a Crisis Project.

People from many parts of the National Academies were involved in the production of the workshops, as well as providing fact sheets on biological, chemical, nuclear, and radiological attacks. The project was funded by the

U.S. Department of Homeland Security and involved close collaboration with the Radio and Television News Directors Foundation.



Public Relations

NAE continued to produce weekly radio segments chronicling engineering innovations and stories for the lay public. These reports are aired many times each week on WTOP Radio, the only all-news radio station in Washington, D.C., and the surrounding region. An accompanying website <www.nae.edu/radio>, which has been revamped to organize segments by topic, provides scripts, audio, and links to more information on each story.



NAE continues to reach out to diverse audiences, including teachers and students, through the Great Engineering Achievements website <www.greatachievements.org>, which is adapted from the 2003 book, *A Century of Innovation: Twenty Engineering Achievements That Transformed Our Lives*. The website received some 117,000 visits in 2005 and is a featured link on many other sites around the globe.



Through a variety of non-programmatic activities, NAE's media/public relations efforts continue to increase the visibility of program initiatives, the president's concerns, and NAE Awards.

Developing Effective Messages Project

In November 2005, NAE received a grant of \$317,000 from the National Science Foundation to expand its efforts to identify and test messages that improve the public image of engineering. This activity is a follow-up to a preliminary focus group held in the spring with support from the Elizabeth and Stephen Bechtel Jr. Foundation. NAE member Don P. Giddens, Georgia Institute of Technology, is chair of the 10-person steering committee that will oversee the project. NAE hopes the results of this initiative will be used by the engineering community to improve the effectiveness of public outreach activities.

Engineering Ethics

NAE and Case Western Reserve University (CWRU) are continuing to implement the transfer of the Online Ethics Center for Engineering and Science <www.onlineethics.org> to NAE. A content management system (CMS) for the website has been developed that offers intuitive navigation, simple ways of citing and sharing content, and dynamically generated lists of related materials. The new CMS is designed to support a distributed content-development model that will make it for easier for scholars and undergraduates alike to contribute to the Online Ethics Center. Other technical features of the system, such as alternatives to auditory and visual content, will make the site more useful and accessible. In 2006, CWRU and NAE will focus on preparing and moving the website content into the new CMS, which is based at NAE.

Diversity in the Engineering Workforce

The mission of the NAE Diversity Program is to increase diversity in the U.S. engineering workforce by developing a strong, diverse domestic talent pool. NAE brings together experts and other stakeholders to share knowledge, identify information, and initiate actions to advance this mission.

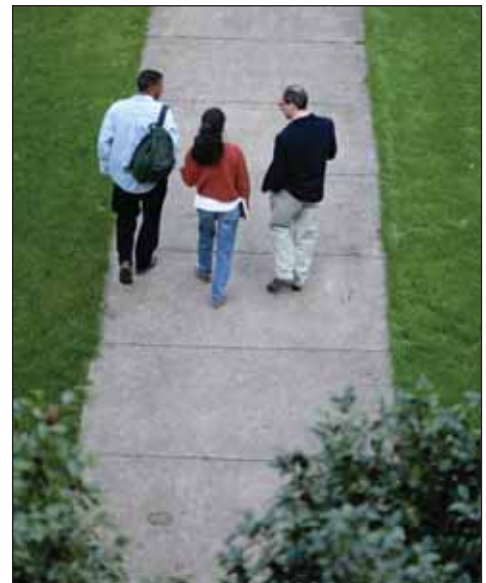
In 2005, the NAE Committee on Diversity in the Engineering Workforce (CDEW), chaired by Karl S. Pister (NAE), University of California at Santa Cruz, completed a three-year Innovation Initiative to develop ways of leveraging the authority and influence of NAE as an organization and of NAE members. Building on the data-gathering activities and relationship-building of the first two years, the project culminated in February 2005 with an implementation planning meeting with the NAE executive office to create a road map for future activities.

Some of the ideas developed in the early stages of the Innovation Initiative led to consensus studies that have already been published (e.g., the role of community colleges in engineering education and the potential for engineering programs at tribal colleges and/or universities). Others are still in the development phase (e.g., instruments for assessing the climate for diversity in academic engineering departments).

Enhancing the Community College Pathway to Engineering Careers

The importance of community colleges in engineering education is a well kept secret, even to many in the engineering community. In point of fact, 20 percent of engineering degree holders began their academic careers with at least 10 credits from community colleges, and 40 percent of the recipients of engineering bachelor's and master's degrees in 1999 and 2000 attended community colleges for some of their training and education. In addition, community colleges have long been recognized as providing educational opportunities for students from diverse racial and ethnic backgrounds. Community colleges have become an educational pipeline for underrepresented minorities entering the higher education system. Many community colleges offer courses in engineering, and some offer associate of science degrees for completion of a two-year engineering program.

With support from the National Science Foundation, a study committee was convened jointly by NAE and the National Research Council Board on Higher Education and Workforce. Published in December 2005, the study focuses on the changing role of community colleges in engineering education,



identifies exemplary practices and partnerships between community colleges and four-year educational institutions, and recommends critical areas for further study. Specific topics include the challenges facing transfer students from community colleges; approaches to recruitment and retention; curricular content, quality, and standards; the case for diversity in engineering; and methods of data collection.

Engineering Studies at Tribal Colleges and Universities

Initiated in 2005, the purpose of this project was to provide expert, independent advice to 11 tribal colleges and universities (TCUs) working toward offering engineering programs. The chief data-gathering activity was a workshop focused on identifying the unique qualities and needs of Native American students, recruiting and retention strategies, financial strategies, and models for implementing and sustaining engineering studies at TCUs. A steering committee planned the workshop and authored a letter report based on the workshop discussion, published in December 2005.

The workshop participants identified several reasons for establishing a four-year engineering program at a TCU: to enable American Indian students to complete a four-year engineering degree in the tribal college system; to reduce the high attrition rate of American Indian students who attend mainstream educational institutions; and to provide an engineering program that is culturally relevant to tribal students. A letter report based on the workshop was published in December 2005.

EngineerGirl! Website

The *EngineerGirl!* website <www.engineergirl.org>, an important part of the NAE web presence, averages more than 1,500 visitors per day. The theme of the website-sponsored essay contest this year was “Engineering: Improving Our World.” Prizes were awarded in two categories, grades 4 through 6 and grades 7 through 9. The winners were announced in February 2006.

A companion website, Celebration of Women in Engineering <www.nae.edu/cwe> provides information on engineering education and careers in engineering for teachers, advisors, club leaders, parents, and other adults who work with girls and young women.



Extraordinary Women Engineers Project

This national initiative encourages girls to consider pursuing degrees and subsequent careers in engineering. The project is headed by a coalition of engineering associations formed in spring 2004. Coalition members include the American Association of Engineering Societies, American Society of Civil Engineers, NAE, and the WGBH Foundation. The coalition conducts consumer research with high school girls, science and math teachers, and school counselors; male and female college-level engineering students; and practicing engineers.

In February 2005, the coalition released *Changing Our World: True Stories of Women Engineers*, a book that acquaints high school girls and other audiences with a diverse group of women engineers and describes how women engineers have contributed to making the world a better place.

NAE will be involved in a number of coalition activities planned for the future.

Gender Equity Extension Project

The purpose of this “train the trainer” project is to provide expertise to groups that train and educate teachers of pre-engineering and engineering courses of study. Experts in gender studies, the research base on science and engineering education, and practical skills in project management are available to assist in academic preparation for teaching engineering from grade 6 (middle school) through the sophomore year of college, managing out-of class or in-class projects, developing curricular content, scope, and sequencing, and advising on curriculum delivery and instructional style.



The project objectives are to familiarize teachers and faculty with the knowledge bases on gender equity, engineering education, and project management. The target audiences are professional societies, school-based groups, and community-based groups that work directly with large numbers of teachers and faculty. The Diversity Program and Center for the Advancement of Scholarship on Engineering Education (CASEE) are working cooperatively on this program.

Frontiers of Engineering

Frontiers of Engineering (FOE) is a symposium series that brings together select groups of emerging engineering leaders from industry, academia, and government laboratories to discuss pioneering technical work and leading-edge research in various engineering fields and industry sectors. The goals of the symposia are: (1) to introduce outstanding engineers (ages 30 to 45) to each other and promote the establishment of contacts among the next generation of engineering leaders; and through this interaction, (2) to facilitate collaboration and the transfer of techniques and approaches across engineering disciplines.

The annual U.S. Frontiers of Engineering (US FOE) Symposium brings together approximately 100 engineers from across the country. FOE also has three bilateral programs—German-American Frontiers of Engineering (GAFOE), Japan-America Frontiers of Engineering (JAFOE), and Indo-U.S. Frontiers of Engineering (Indo-USFOE)—that bring together approximately 30 engineers from each country. NAE’s partner for the GAFOE program is the Alexander von Humboldt Foundation. The Japan Science and Technology

Agency and the Engineering Academy of Japan are partners in the JAFOE program. The partner organization in the Indo-U.S. FOE program is the Indo-U.S. Science and Technology Forum.

Three FOE symposia were held in 2005. At the GAFOE symposium in May in Potsdam, Germany, the topics were air transportation, control and remediation technologies for energy byproducts, visual communication, and micro-reactors in chemical synthesis/drug development. In September, the US FOE meeting was held at GE Global Research Center in Niskayuna, New York. The topics were ID and verification technologies, engineering for developing communities, engineering complex systems, and energy resources for the future. The JAFOE symposium was held in November at Hitachi Global Storage Technologies in San Jose, California. The topics for the symposium were humanoid robots, pure water technologies, semiconductor research and development, and biotechnology: detection and destruction of pathogens. During 2005, NAE also began planning for the 2006 launch of the Indo-US FOE program.

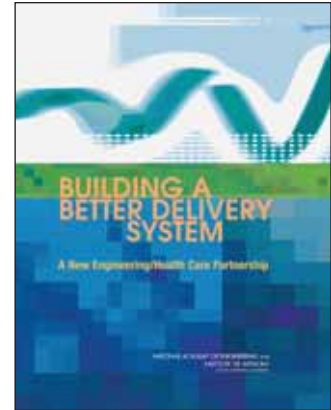
FOE encourages continuing interaction among participants in FOE symposia through ongoing outreach activities. Proceedings, such as *Frontiers of Engineering: Reports on Leading Edge Engineering from the 2004 NAE Symposium on Frontiers of Engineering*, which was published in February 2005, are mailed to all past U.S. FOE participants. Other outreach activities include U.S. and bilateral FOE alumni newsletters, which enable alumni to keep in touch and share information about their work, and an FOE website that includes a searchable database, a directory of all FOE alumni, and access to presentations from the U.S. FOE meeting. In addition, the Alexander von Humboldt Foundation provides support for ongoing collaborations among participants in GAFOE symposia.

Lillian M. Gilbreth Lectureships for Young Engineers

The Lillian M. Gilbreth Lectureships for Young Engineers, a related but independent program, selects outstanding engineers from among FOE speakers to give presentations at the NAE Annual Meeting in Washington, D.C., and the NAE National Meeting in Irvine, California. In 2005, four speakers presented Gilbreth lectures at the National Meeting. Tommaso Rivellini, lead mechanical engineer of the Entry, Descent, and Landing Program for the Mars Science Laboratory at the Jet Propulsion Laboratory, presented "The Challenges of Landing on Mars." Jon Berkoe, senior principal engineer and manager of advanced simulation and analysis at Bechtel National Inc., presented "The Role of Modeling and Simulation in Extreme Engineering Projects." Dr. Connie Chang-Hasnain, professor of electrical engineering and computer sciences at the University of California, Berkeley, spoke on "Progress and Prospects of Enabling Optoelectronic Devices for Broadband Communication." Dr. Paul Debevec, executive producer of graphics research and research assistant professor at the Institute for Creative Technologies at the University of Southern California, presented "Capturing and Simulating Physically Accurate Illumination in Computer Graphics." One Gilbreth speaker addressed the NAE Annual Meeting. Dr. Stephen Intille, research scientist and technology director of the Home of the Future Project at the Massachusetts Institute of Technology presented "Ubiquitous Computing Technologies to Encourage Aging in Place."

Engineering and the Health Care System

Building a Better Delivery System: A New Engineering/Health Care Partnership (2005) is the result of a collaborative study by NAE and the Institute of Medicine (IOM). The goal of the study was to identify engineering applications and research directions to address quality and productivity challenges to U.S. health care delivery through system-wide improvements that will benefit all Americans. The authoring committee calls for an engineering approach to the design/redesign of health care delivery systems. Co-chairs of the study's authoring committee were NAE Home Secretary W. Dale Compton, Purdue University, and IOM member, Jerome H. Grossman, Harvard University.



The report focuses on (1) system design, analysis, and control tools and associated research to advance understanding of processes and system interactions and improve/optimize health care system performance within the constraints of the system, and (2) information and information/communication technologies and associated research to improve connectivity, information flow, and coordination. The report recommendations focus on specific public- and private-sector actions to (1) advance the development, adaptation, and use of systems engineering tools in the health care sector; (2) accelerate the establishment and continued evolution of a National Health Information Infrastructure/Network (NHII/NHIN) capable of incorporating wireless integrated microsystems and other next-generation information/communication technologies; and (3) create a sustainable, university-based capability for multidisciplinary research and the education and training of health professionals, engineers, managers, and social scientists in the systems engineering of health care delivery.

Since the report was released at a workshop in July 2005, the NAE/IOM committee co-chairs and study director have been leveraging the resources of the National Academies to strengthen and expand the networks of expertise developed during the project and to identify opportunities for using systems engineering and information/communications technologies to improve quality and productivity in health care. Post-publication activities have included briefs for project sponsors (National Science Foundation (NSF), Robert Wood Johnson Foundation, and National Institute of Biomedical Imaging and Bioengineering) and interested stakeholders at the National Library of Medicine, National Cancer Institute, Veterans' Health Administration, Agency for Healthcare Research and Quality, U.S. Department of Defense (DOD) Office of Health Affairs, Telemedicine and Advanced Technology Research Center, Office of the National Coordinator for Health Information Technology, and the American Medical Informatics Association. In addition, copies of the report have been sent to individual engineering leaders and leading health care professionals. To date, more than 1,800 copies of the published report have been distributed to leaders in the engineering, health care, and public policy communities.

Technology for a Quieter America

Unwanted or harmful sounds—noise—have an impact on the quality of life of many Americans. The impact is reflected in the estimated 10 million Americans with some degree of noise-induced hearing loss and the estimated 30 million individuals exposed to dangerous levels of noise each day. Statistics show that the most common community complaints are related to unwanted noise.

The sources of noise are almost invariably byproducts of engineered systems that serve other societal needs. These include air transportation; highway and rail transportation; the operation of construction and other heavy equipment; large infrastructure projects, such as natural gas pipelines; manufacturing equipment; household appliances; and even toys and consumer electronics.



Efforts in the United States to address noise-related concerns have been uneven over the last 30 years. Other regions in the world have taken the lead in developing noise standards for various situations and applications—for example, for construction equipment. Some of these regulations may limit the export of American products.

Significant advances have been made in understanding how individuals react to and are impacted by noise from both an auditory and a non-auditory standpoint. A growing body of evidence shows that high noise levels delay learning of reading and mathematics at the elementary and middle school levels. However, the metrics that have been used to assess noise levels have not always been based on the most up-to-date technologies.

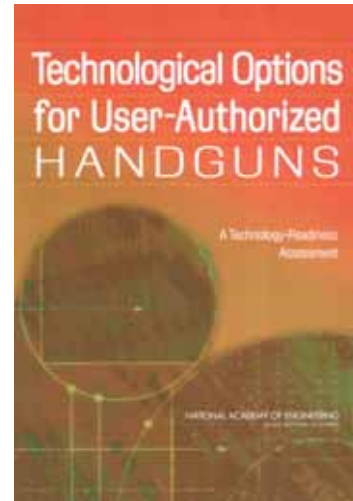


In September 2005, NAE hosted a three-day workshop for more than 70 engineers and scientists who specialize in noise-control technologies. The goal of the meeting was to discuss individual and cross-cutting concerns associated with noise-control engineering and noise-related policy. The results of this meeting were used to develop a plan for a study of unwanted noise and noise-related policy. The plan for a 30-month study was approved in January 2006.

User-Authorized Handgun Technology

The primary method of preventing the misuse of handguns has been to encourage gun owners to store and handle handguns properly. In recent years, technology has offered a potential alternative solution—a user-authorized handgun that would “recognize” the owner or other authorized user and fire only when that individual, and no one else, wanted the gun to fire. A variety of sensor, electronic, mechanical, and other technologies might be used in the design of such a weapon.

In 2005, NAE published *Technological Options for User-Authorized Handguns: A Technology-Readiness Assessment*. The report is the culmination of more than a year of data gathering and analysis by the 11-person Committee on User-Authorized Handguns. The report discusses the technical requirements and specifications for two types of firearms, those used primarily by homeowners and those used primarily by law enforcement; describes the state of the art for several biometric-based authentication technologies; and estimates the time and money required to bring the most promising of these technologies to the marketplace. The project was funded by the David and Lucille Packard Foundation and NAE. NAE Executive Officer Lance Davis chaired the study panel.



The report follows a June 2002 NAE workshop on the technical, criminal, health, and legal issues surrounding user-authorized handguns. A report based on that workshop, *Owner-Authorized Handguns: A Workshop Summary*, was published in 2003.

Grainger Challenge Prize for Sustainability

In 2005, a pivotal year for the Grainger Challenge, a final decision was made defining the nature of the challenge—the development of a convenient, low-cost, point-of-use arsenic treatment process for use in poor countries where rural residents suffer from severe arsenic poisoning as a result of drinking contaminated groundwater. This problem is most prevalent in Bangladesh, eastern India, and other countries in the region.

An expert committee headed by Charles O’Melia (NAE) of the Johns Hopkins University was assembled to lead the project. A detailed description was posted on the NAE website soliciting comments and inquiries from interested parties, and a targeted information campaign was implemented to reach out to the engineering community in the United States. A process was also developed for attracting a broad range of contestants. Of the more than 300 e-mails received in response,

100 expressed an interest in participating. Of these, more than 70 competitors provided full proposals and expressed their intention to participate. In early 2006, the proposals were reviewed and the most promising were selected for testing in a laboratory setting.

To date, the Grainger Challenge has fulfilled its promise of mobilizing the U.S. engineering community to focus its efforts on issues of sustainability in developing countries. In 2006, finalists will be chosen and a testing program undertaken to identify three systems with the potential to make a fundamental difference in the lives of rural populations in South Asia.

China/U.S. Energy-Air Pollution Study

This joint NAE/PGA consensus study is the current phase of an ongoing cooperative program with the Chinese Academies dating back to the late 1990s. The number of economic, scientific, and technical issues common to China and the United States is increasing daily, and ongoing exchanges are vital to the national interests of both countries. This is especially important today as China attempts to secure energy concessions from around the world to supply transportation fuel for its increasing number of vehicles.



China's most secure form of energy remains indigenous coal, which provides much of its electric power, urban heating, and cooking power. However, burning coal has had severe adverse effects on air quality, public health, and biota and water resources. Economists have determined that China's vaunted growth in GDP rate would be several points higher without the pollution.

In 2005, a study committee headed by John Watson, a noted air-quality researcher from the Desert Research Institute, visited two Chinese cities, Huainan and Dalian. The committee toured industrial facilities and research institutes and met with its Chinese counterparts. Plans were made for the study and a visit by the Chinese team to the United States in early 2006 to Pittsburgh and Los Angeles, two cities with interesting histories of air pollution.



The study, scheduled to be completed in late 2006, will contrast

U.S. and Chinese approaches to managing urban air pollution in the four study cities. It will include discussions of regulatory institutions, compliance approaches, and performance; the overall objectives for local and national energy policy and implications for air quality; changes in air quality as sulfur and particulate controls are implemented on the one hand and the number of vehicles increases on the other; and recommendations to Chinese policy makers based on experience in the United States. Los Angeles in particular can provide valuable lessons in terms of regional air quality management and technologies in the power and transportation sectors. Perhaps more important will be to show our Chinese counterparts that the openness of officials and public access to air-quality data in the United States have led to less expensive, more efficient pollution control.

Countering a Terrorist Attack on the U.S. Electrical Transmission and Distribution System

This joint NAE/NRC study funded by the U.S. Department of Homeland Security formally began in 2005 under the leadership of Granger Morgan of Carnegie Mellon University. The study committee includes representatives of the public utility, academic, private-sector, and regulatory communities. The goal of the study is to identify the vulnerabilities of the U.S. electrical transmission system to a terrorist attack. The economic implications of a massive system failure, particularly for the physical security of U.S. citizens, are not well understood. As recent events in the Gulf Coast area have shown, the lack of electrical power can have long-term consequences for the economic and psychological health of entire communities.

During 2005, the committee held two fact-finding meetings at which members had the opportunity to hear from a variety of speakers and institutions. It quickly became clear that the electrical transmission and distribution system is extremely vulnerable, partly because it is already overloaded much of the time because of a lack of investment as electricity demand has increased. Thus, it is very difficult to separate current deficiencies in the system from vulnerabilities to terrorist attack.



The study is expected to be completed in late 2006 or early 2007. Outstanding issues include access to, and the handling of, sensitive and classified information, which the committee has yet to evaluate.

Engineering Research and America's Future: Meeting the Challenges of a Global Economy

With funding from the National Science Foundation, NAE convened a committee of engineering leaders during the summer of 2004 to conduct (1) an assessment of the past and potential impact of the U.S. engineering research enterprise on the nation's economy, quality of life, security, and global leadership; and (2) to determine whether the level of public and private investment is sufficient to sustain U.S. preem-



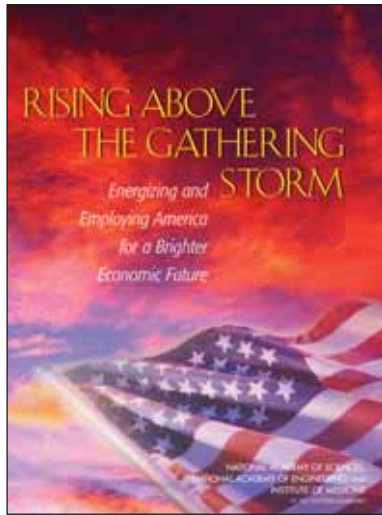
inence in basic engineering research. The committee, chaired by NAE member James Duderstadt, President Emeritus, University of Michigan, documented and evaluated recent contributions of U.S.-based engineering research to critical national interests; assessed the potential contributions of engineering research to emerging national challenges and opportunities; and outlined a national strategy for ensuring that the engineering research foundations of American global economic, military, scientific, and technological preeminence remain solid in the face of rapid, often disruptive, societal and global change. Findings and recommendations are intended to inform pub-

lic-sector and private-sector decision making regarding the scale and allocation of investments in engineering research, engineering research infrastructure, and engineering education. Implementation of the committee's recommendations would strengthen the U.S. engineering research enterprise and ensure that engineering research continues to contribute to U.S. economic prosperity, national security, and global technological leadership. To date, more than 1,200 copies of the report have been disseminated throughout the U.S. engineering community, to leaders in industry and academia, and to the policy-making community.

Gathering Storm Gains Momentum

Today the United States leads the world in science and technology development and enjoys a robust economy derived in large part from scientific and technological innovation. However, danger signs are appearing on the horizon that the historical dominance of the United States in these areas is being threatened. U.S. students score below the international average in math and science, and, for the cost of a chemist or engineer in the United States, a company can hire about five chemists in China or 11 engineers in India. U.S. industry spends more on tort litigation than on research and development. These and other factors indicate that America's advantages are beginning to erode.

This was the conclusion of *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future*, a landmark report from the National Academies. The distinguished committee that wrote the report was chaired



by NAE member Norman Augustine—retired chair of Lockheed Martin—and included Nobel laureates and prominent business, government, and academic leaders, nine of them NAE members. The report sounds a strong warning that the United States is losing its global competitive edge in research and technology and that unless we take concrete steps now, U.S. prosperity will decline.

These are not new concerns. Many similar warnings have been issued in the past by Thomas Friedman of the *New York Times*, Rep. Sherwood Boehlert, chair of the House Science Committee, and Sens. Lamar Alexander and Jeff Bingaman, to name a few. “We’re now playing in a tougher league,” Alexander said. “China and India are competing for our jobs. The best way to keep those jobs in America is to maintain our brainpower edge in science and technology.”

Rising Above the Gathering Storm stresses two major challenges to U.S. pre-eminence in science and engineering: (1) the need for high-quality jobs for Americans; and (2) the need for clean, affordable, reliable energy. The report recommends that the government provide incentives for promising students to pursue careers in science and math, funding for professional development for math and science teachers, and an increase of 10 percent per year for the next seven years in funding for basic science research. In addition, policy makers should establish an organization in the U.S. Department of Energy to sponsor innovative research to meet the nation’s long-term energy challenges.

To the excitement of many who have called for government action, the Academies report propelled both the executive and legislative branches into declaring science and math education and basic science research top priorities. “Sometimes these things sit for years,” said Alexander, who commissioned the report with Bingaman, “and then suddenly they come together in a big way.”

Shortly after the release of the report last fall, Sen. Nancy Pelosi announced steps to embrace its recommendations. Various congressional and White House briefings followed, led by Augustine and fellow committee members, NAS President Ralph Cicerone, and NAE President Wm. Wulf, urging government to take action.

During his 2006 State of the Union Address, President Bush announced the American Competitiveness Initiative, which incorporates many of the recommendations in the report. This presidential initiative has encouraged a flurry of legislative activity. In both the Senate and the House, committees have outlined legislation based on the report. One bipartisan package of bills, Protecting America's Competitive Edge Act, introduced by Alexander and Bingaman, along with Sens. Pete Domenici, Barbara Mikulski, and Craig Thomas, implements all 20 of the recommended action items.

And the ripple effects continue. The Association of American Universities recently submitted a proposal to President Bush and Congress calling for improving the quality of teaching through partnerships among educators, businesses, and government and through increased funding for research. Rep. Frank Wolf, chair of the House Appropriations Subcommittee for Science; the U.S. Departments of State, Justice, and Commerce; and related agencies strongly support increases in basic science research proposed in the report and the presidential initiative. "I don't plan to spend a year talking about it, like we had to do last year," Wolf said. "We're going to get it done."

2005 NAE AWARDS RECIPIENTS

Charles Stark Draper Prize

Recognized as one of the world's preeminent awards for engineering achievement, this prize honors an engineer or engineers whose contributions have significantly improved the quality of life, enabled people to live more freely and comfortably, or enabled access to information. Presented annually, the prize carries a \$500,000 cash award.



Minoru S. "Sam" Araki, Francis J. Madden, Edward A. Miller, James W. Plummer, and Don H. Schoessler
"for the design, development, and operation of Corona, the first space-based Earth observation system."



Minoru S. "Sam" Araki



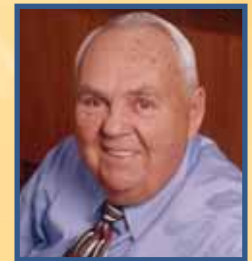
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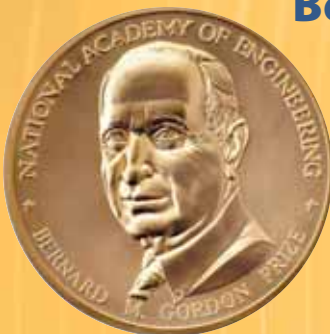


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Bernard M. Gordon Prize



The Gordon Prize for Innovation in Engineering and Technology Education is a cash prize of \$500,000, shared between the educator(s) and the educational institution, to support continuation of the award-winning program. The Gordon Prize honors technology educators whose innovative programs have strengthened the engineering workforce by cultivating students' leadership, creativity, and teamwork skills.

Leah H. Jamieson, Edward J. Coyle, and William C. Oakes "for innovations in the education of tomorrow's engineering leaders by developing and disseminating the Engineering Projects in Community Service (EPICS) program." (Purdue University, IN)



Leah H. Jamieson



Edward J. Coyle



William C. Oakes

Fritz J. and Dolores H. Russ Prize



The Russ Prize is awarded in recognition of outstanding achievement in an emerging engineering field that improves the quality of life and has widespread application or use. The prize is currently focused on bioengineering and encouraging the engineering and medical/biological professions to work together. Presented biennially, the prize carries a \$500,000 cash award.

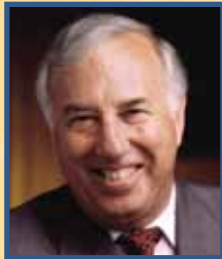
Dr. Leland C. Clark, Jr., “for bioengineering membrane-based sensors in medical, food, and environmental applications.”



Dr. Leland C. Clark, Jr.

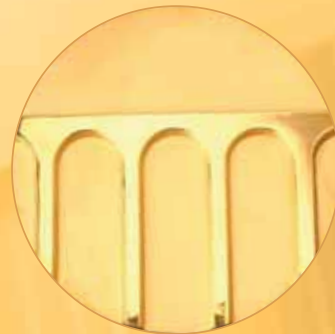
Founders Award

The Founders Award is given in recognition of an NAE member or foreign associate who has exemplified the ideals and principles of NAE through professional, educational, and personal achievement and accomplishment. The Founders Award is presented at the NAE Annual Meeting in October and carries a \$2,500 cash prize.



C. D. (Dan) Mote, Jr.

C. D. (Dan) Mote, Jr., “For the creation of a comprehensive body of work on the dynamics of moving flexible structures and for leadership in academia.”



Arthur M. Bueche Award

The Bueche Award honors an engineer who has been actively involved in advancing U.S. science and technology policy, promoting U.S. technological development, and improving relations between industry, government, and universities. The award is presented at the NAE Annual Meeting and carries a \$2,500 cash prize.



Leo Young “For leadership in sponsoring collaborative research programs among academic, industrial, and government engineers and scientists.”



Leo Young

For additional information about the NAE awards, please visit our website <www.nae.edu/awards>.

2005 NEW MEMBERS AND FOREIGN ASSOCIATES

In February, NAE elected 74 new members and 10 foreign associates, bringing the total U.S. membership to 2,195 and the number of foreign associates to 178. Election to the National Academy of Engineering is among the highest professional distinctions accorded an engineer. Academy membership honors those who have made outstanding contributions to “engineering research, practice, or education, including, where appropriate, significant contributions to the engineering literature” and to the “pioneering of new and developing fields of technology, making major advancements in traditional fields of engineering, or developing/implementing innovative approaches to engineering education.”

A list of the newly elected members and foreign associates follows, with their primary affiliations at the time of election.

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NATIONAL ACADEMY OF ENGINEERING FUND FINANCIAL REPORT

Governed by the National Academy of Engineering Fund (NAEF) Board of Trustees, the NAEF is the tax-exempt corporation (under section 501(c)(3) of the Internal Revenue Code) that serves as a holding entity for the independent assets and operating funds of the National Academy of Engineering (NAE). The NAE operates within the charter and framework of the National Academy of Sciences (NAS).

The table on page 32 summarizes both the NAEF and outside operating revenue and expenses as well as non-operation-related transactions for the NAE for 2005 and 2004. The information on the NAEF presented in this table has been extracted from the Fund's audited financial statements also contained in this report.

During 2005, contributions for the National Academy of Engineering were solicited from corporations, NAE members, and private foundations. These funds and contracts and grants from the federal government are a major source of support for the Academy's self-initiated programs, which are described in this report.

A second source of revenue for the Academy is the allocation from the overhead charge assessed on government and privately funded contracts for National Research Council (NRC) projects; the NRC is the operating arm of the NAE and the National Academy of Sciences. This allocation is used to offset expenses incurred in the oversight function and for such other administrative operations as NAE membership services and governance.

Under a policy established by the NAEF Board of Trustees, the Academy may use a certain percent of its unrestricted invested assets for operations each year. In 2005, 3.4 percent was allocated for normal operating expenses and 2.6 percent was allocated for fund-raising expenses. This allocation, combined with annual meeting registration fees, membership dues, and investment earnings on current operating funds, make up the remainder of the Academy's operating revenue.

The Academy welcomes corporate and private gifts, which are used to help finance the research, education, and public information programs of the institution. The NAE does not, however, conduct proprietary studies for private clients or corporations.

NAE/NAEF Combined Summary of Revenues, Expenses, and Changes in Net Assets (Unaudited Pro Forma)

(Thousands of Dollars)

	2005	2004
NET ASSETS, BEGINNING	\$64,406	\$64,786
CONTRIBUTIONS RECEIVABLE, NET	1,398	1,996
TOTAL ASSETS, BEGINNING	\$65,804	\$66,782
OPERATIONS		
Revenue		
Contributions (Unrestricted)	\$1,457	\$973
Dues (Annual), Fees, Miscellaneous	247	250
Indirect Allowance From Contracts and Grants	2,723	2,731
Award Specific Funds Allocation to Operations*	2,403	1,789
Program Specific Funds Allocation to Operations*	3,789	3,014
Unrestricted Allocation to Operations	2,107	2,121
Total Operations Revenue	\$12,726	\$10,878
Expenses		
Awards	\$2,423	\$1,808
Development	823	809
Management	1,893	1,901
Membership	1,138	1,047
National Academies Activities Programs	323	305
	5,466	4,821
Total Operations Expenses	\$12,066	\$10,691
OPERATIONS SURPLUS	\$660	\$187
NONOPERATIONAL TRANSACTIONS		
Allocation to Operations	(\$5,730)	(\$4,909)
Contributions to Reserves	2,450	1,540
Dues (Lifetime), Miscellaneous	101	105
Gain (loss) on Investments	(443)	3,306
Investment Earnings (Interest and Dividends)	1,873	1,878
Capital Campaign Settlement	0	(2,210)
Investment Fees	(265)	(277)
NONOPERATIONAL LOSS	(\$2,014)	(\$567)
NET ASSETS, ENDING	\$63,052	\$64,406
CONTRIBUTIONS RECEIVABLE, NET	1,615	1,398
TOTAL ASSETS, ENDING	\$64,667	\$65,804

*Restricted funds are reported in this unaudited-pro forma report as operating revenue when earned

NOTE: The audited financial statements that follow record contributions as revenue the year in which the pledge is received in accordance with generally accepted accounting principles.

NATIONAL ACADEMY OF ENGINEERING FUND

December 31, 2005 and 2004

Report of Independent Certified Public Accountants

Board of Trustees
National Academy of Engineering Fund

We have audited the accompanying statement of financial position of the National Academy of Engineering Fund (the Fund) as of December 31, 2005, and the related statements of activities and cash flows for the year then ended. These financial statements are the responsibility of the Fund's management. Our responsibility is to express an opinion on these financial statements based on our audit. The prior-year summarized comparative information has been derived from the Fund's 2004 financial statements and, in our report dated March 25, 2005, we expressed an unqualified opinion on those financial statements.

We conducted our audit in accordance with auditing standards generally accepted in the United States of America, as established by the Auditing Standards Board of the American Institute of Certified Public Accountants. Those standards require that we plan and perform the audit to obtain reasonable assurance about whether the financial statements are free of material misstatement. An audit includes consideration of internal control over financial reporting as a basis for designing audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Fund's internal control over financial reporting. Accordingly, we express no such opinion. An audit also includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements, assessing the accounting principles used, and significant estimates made by management, as well as evaluating the overall financial statement presentation. We believe that our audit provide a reasonable basis for our opinion.

In our opinion, the financial statements referred to above present fairly, in all material respects, the financial position of the National Academy of Engineering Fund as of December 31, 2005, and the changes in its net assets and its cash flows for the year then ended, in conformity with accounting principles generally accepted in the United States of America.

Grant Thornton LLP

Vienna, Virginia
March 29, 2006

NATIONAL ACADEMY OF ENGINEERING FUND

Statements of Financial Position

December 31,	2005	2004
Assets		
Current Assets		
Cash and cash equivalents	\$ 340,680	\$ 442,392
Short-term investments	1,390,433	250,691
Contribution receivable	560,077	585,349
Award medals and other assets	132,553	142,633
Total Current Assets	2,423,743	1,421,065
Non-current Assets		
Contribution receivable—long-term portion, net	1,055,027	812,905
Investments	61,479,272	66,116,058
Total Non-current Assets	62,534,299	66,928,963
Total Assets	\$ 64,958,042	\$ 68,350,028
Liabilities and Net Assets		
Liabilities		
Accounts payable—National Academy of Sciences	\$ 291,283	\$ 2,545,709
Commitments and Contingencies	—	—
Net Assets		
Unrestricted	31,082,089	31,985,655
Temporarily restricted	8,054,480	8,491,865
Permanently restricted	25,530,190	25,326,799
Total Net Assets	64,666,759	65,804,319
Total Liabilities and Net Assets	\$ 64,958,042	\$ 68,350,028

NATIONAL ACADEMY OF ENGINEERING FUND

Statements of Activities and Changes in Net Assets

Year ended December 31,

	2005				2004
	Unrestricted	Temporarily Restricted	Permanently Restricted	Total	Total
Revenue					
Interest and dividends	\$ 906,430	\$ 971,482	\$ —	\$ 1,877,912	\$ 1,879,005
Realized gain on investments	736,220	766,014	—	1,502,234	2,000,206
Contributions	1,094,129	2,834,418	203,391	4,131,938	1,855,249
Membership dues	236,220	—	—	236,220	232,980
Registration fees	80,470	—	—	80,470	88,465
Miscellaneous revenue	30,508	—	—	30,508	27,451
Net assets released from restrictions:					
Satisfaction of program restrictions	3,864,243	(3,864,243)	—	—	—
Satisfaction of time restrictions	153,611	(153,611)	—	—	—
Total Revenue	7,101,831	554,060	203,391	7,859,282	6,083,356
Expenses					
Program services:					
Programs	2,698,749	—	—	2,698,749	2,607,335
Member programs	202,029	—	—	202,029	200,017
Support for NRC and NAS	322,714	—	—	322,714	305,180
Awards	2,423,131	—	—	2,423,131	1,807,719
Total program services	5,646,623	—	—	5,646,623	4,920,251
Supporting services:					
Fundraising	822,500	—	—	822,500	3,018,913
Operations	582,851	—	—	582,851	503,547
Total supporting services	1,405,351	—	—	1,405,351	3,522,460
Total Expenses	7,051,974	—	—	7,051,974	8,442,711
Change in Net Assets Before					
Unrealized (Loss) Gain on Investments	49,857	554,060	203,391	807,308	(2,359,355)
Unrealized (loss) gain on investments	(953,423)	(991,445)	—	(1,944,868)	1,382,099
Change in Net Assets	(903,566)	(437,385)	203,391	(1,137,560)	(977,256)
Net Assets, beginning of year	31,985,655	8,491,865	25,326,799	65,804,319	66,781,575
Net Assets, end of year	\$31,082,089	\$ 8,054,480	\$25,530,190	\$64,666,759	\$65,804,319

NATIONAL ACADEMY OF ENGINEERING FUND

Statements of Cash Flows

Year ended December 31,	2005	2004
Cash Flows from Operating Activities		
Change in net assets	\$ (1,137,560)	\$ (977,256)
Adjustments to reconcile change in net assets to net cash (used in) provided by operating activities:		
Realized gain on investments	(1,502,234)	(2,000,206)
Unrealized loss (gain) on investments	1,944,868	(1,382,099)
Changes in assets and liabilities:		
Contributions receivable	(216,850)	597,932
Accounts receivable—other	—	174,121
Award medals	10,080	6,776
Accounts payable—National Academy of Sciences	(2,254,426)	2,104,307
Net Cash Used in Operating Activities	(3,156,122)	(1,476,425)
Cash Flows from Investing Activities		
Proceeds from sale of investments	37,447,500	81,118,356
Purchase of investments	(34,393,090)	(79,460,013)
Net Cash Provided by Investing Activities	3,054,410	1,658,343
Net (Decrease) Increase in Cash and Cash Equivalents	(101,712)	181,918
Cash and Cash Equivalents, beginning of year	442,392	260,474
Cash and Cash Equivalents, end of year	\$ 340,680	\$ 442,392

NATIONAL ACADEMY OF ENGINEERING FUND

Notes to Financial Statements

December 31, 2005 and 2004

NOTE A—GENERAL INFORMATION AND SUMMARY OF SIGNIFICANT ACCOUNTING POLICIES

General Information

The National Academy of Engineering Fund (the Fund) is an independent non-profit organization established by the National Academy of Engineering (NAE) to collect and disburse funds for accomplishing the goals of NAE. NAE operates within the charter and framework of the National Academy of Sciences (NAS), which accounts for NAE's expenses. The operating expenditures of NAE are accounted for by offices of NAS, and are offset by reimbursement from funds received from the Fund and from contracts administered by NAS on behalf of the National Research Council (NRC), which is the operating arm of NAS and NAE. The net expenditures of NAE, except for the approved budgeted indirect costs, are paid by the Fund to balance accounts with NAS.

Basis of Accounting

The Fund's financial statements are prepared using the accrual basis of accounting.

Cash and Cash Equivalents

For purposes of the statement of cash flows, the Fund considers all investments purchased with an original maturity of three months or less to be cash equivalents, except for the cash in the investment portfolio, which will be reinvested on a long-term basis.

Short-term Investments

Temporary investments consist of money market funds that are used to fund normal operations of the Fund and are recorded at their readily determinable fair values as determined by quoted market prices.

Contributions Receivable

Unconditional promises to give are recognized as revenue and contributions receivable in the period the promises are made. Unconditional promises to give that are expected to be collected within one year are recorded at their net realizable value.

Unconditional promises to give that are expected to be collected in future years are recorded at the present value of their estimated future cash flows. The discounts on those amounts are computed using risk-free interest rates commensurate with the risk involved applicable to the years in which the promises are received. Amortization of the discounts is included in contribution revenue. Conditional promises to give are not included as support until the conditions are substantially met.

Awards Medals

The Fund maintains gold medals for various awards, which are carried at cost.

Investments

Investments, consisting of cash and money market funds, federal agency securities, treasury securities, corporate debt securities, and equity securities, are recorded at readily determinable fair values determined by quoted market price.

Temporarily Restricted Net Assets

Temporarily restricted net assets consist of amounts that are subject to donor-imposed time or purpose restrictions and income earned on temporarily and permanently restricted net assets. The Fund is permitted to use or expend the donated assets in accordance with the donor restriction.

Permanently Restricted Net Assets

Permanently restricted net assets consist of assets whose use is limited by donor-imposed restrictions that neither expire by the passage of time nor can be fulfilled or otherwise removed by action of the Fund. The restrictions stipulate that resources be maintained permanently, but permit the Fund to expend the income generated in accordance with the provisions of the agreement. Permanently restricted net assets consist of the following:

Draper Prize—represents an endowment given by the donor for the purpose of establishing and awarding an annual prize in honor of the memory of Charles Stark Draper. It is the Fund's intention to use the investment earnings of the endowment to cover the expenses incurred in connection with administration of the prize and in providing the honorarium awarded with the prize.

Notes to Financial Statements (Continued)

Gordon Prize—represents an endowment given by the donor for the purpose of establishing and awarding an annual prize in honor of Bernard M. Gordon. It is the Fund's intention to use the investment earnings of the endowment to cover the expenses incurred in connection with administration of the prize and in providing the honorarium awarded with the prize.

Capital Preservation and Hans Reissner—represent endowments requiring that the principal be invested and that only the income be used for general operations of NAE.

Hollomon—represents an endowment requiring that the principal be maintained in perpetuity and that the income be used to support the Hollomon Fellow.

Industry Scholar—represents an endowment to support fellowships for recently retired corporate executives to assist with strategy and management of program activities in NAE and NRC.

Senior Scholar—represents an endowment to support an outstanding member of industry or another field working as an advisor and assistant to the president of NAE in the management and execution of NAE's programmatic activities.

Young Engineer—represents an endowment to support programs aimed at engaging engineers at a younger age in the activities of NAE, and to provide an opportunity to identify nominees from industry for membership in NAE.

Restricted Support

The Fund reports gifts of cash and other assets as restricted support if they are received with donor stipulations that limit the use of the donated assets. When a donor restriction expires, i.e., when a stipulated time restriction ends or purpose restriction is accomplished, temporarily restricted net assets are reclassified to unrestricted net assets and reported in the statement of activities as net assets released from restrictions.

Allocation of Expenses

The costs of providing various programs and other activities have been summarized on a functional basis in the statement of activities. Accordingly, certain costs have been allocated among the programs and supporting services benefited.

Income Taxes

The Fund is incorporated under the District of Columbia Non-profit Corporation Act and is exempt from income taxes under Section 501(c)(3) of the Internal Revenue Code. In addition, the Fund has been determined by the Internal Revenue Service not to be a private foundation. The Fund is required to remit income taxes to the federal government and the District of Columbia for unrelated business income. For the years ended December 31, 2005 and 2004, there was no unrelated business income and, consequently, no provision for income taxes has been made.

Use of Estimates

In preparing financial statements in conformity with accounting principles generally accepted in the United States of America, management is required to make estimates and assumptions that affect the reported amounts of assets and liabilities and the disclosure of contingent assets and liabilities at the date of the financial statements and revenue and expenses during the reporting period. Actual results could differ from those estimates.

Reclassifications

Certain 2004 amounts have been reclassified to conform to the 2005 presentation.

Notes to Financial Statements (Continued)**NOTE B—CONTRIBUTIONS RECEIVABLE**

Contributions receivable consist of unconditional promises to give and are deemed fully collectible as follows at December 31, 2005:

	Unrestricted	Restricted	Total
Unconditional promises to give	\$ 306,000	\$ 1,352,361	\$ 1,658,361
Less: unamortized discount	—	(43,257)	(43,257)
Net unconditional promises to give	\$ 306,000	\$ 1,309,104	\$ 1,615,104
Amounts due in:			
Less than 1 year	\$ 306,000	\$ 254,077	\$ 560,077
1 to 5 years	—	1,055,027	1,055,027
	\$ 306,000	\$ 1,309,104	\$ 1,615,104

Contributions receivable consist of unconditional promises to give and are deemed fully collectible as follows at December 31, 2004:

	Unrestricted	Restricted	Total
Unconditional promises to give	\$ 292,274	\$ 1,129,523	\$ 1,421,797
Less: unamortized discount	—	(23,543)	(23,543)
Net unconditional promises to give	\$ 292,274	\$ 1,105,980	\$ 1,398,254
Amounts due in:			
Less than 1 year	\$ 292,274	\$ 293,075	\$ 585,349
1 to 5 years	—	812,905	812,905
	\$ 292,274	\$ 1,105,980	\$ 1,398,254

Net restricted contributions consist of \$96,579 and \$327,204 at December 31, 2005 and 2004, respectively, which is subject to time restrictions, and \$1,212,525 and \$778,776 at December 31, 2005 and 2004, respectively, which is subject to donor-imposed purpose restrictions.

Notes to Financial Statements (Continued)**NOTE C—INVESTMENTS**

Investments at fair value consist of the following at December 31:

	2005	2004
Cash and money market	\$ 4,463,937	\$ 3,527,845
Federal agency securities	15,168,078	14,497,030
Certificate of deposit	863,924	876,215
Corporate debt securities	7,848,312	11,104,743
Equity securities	28,056,631	29,255,854
Managed futures	6,468,823	7,105,062
	<hr/>	<hr/>
	62,869,705	66,366,749
Less: short-term investments	(1,390,433)	(250,691)
	<hr/>	<hr/>
	\$ 61,479,272	\$ 66,116,058

Investments are further classified as follows at December 31:

Unrestricted	\$ 31,173,559	\$ 33,885,279
Temporarily restricted	6,279,673	7,541,313
Permanently restricted	25,416,473	24,940,157
	<hr/>	<hr/>
	\$ 62,869,705	\$ 66,366,749

Investment return consists of the following at December 31:

Dividends and interest	\$ 1,877,912	\$ 1,879,005
Unrealized (loss) gain	(1,944,868)	1,382,099
Realized gain (loss)	1,502,234	2,000,206
	<hr/>	<hr/>
	\$ 1,435,278	\$ 5,261,310

Notes to Financial Statements (Continued)

NOTE D—PERMANENTLY AND TEMPORARILY RESTRICTED NET ASSETS

Permanently and temporarily restricted net assets consist of the following at December 31, 2005:

	Permanently Restricted	Temporarily Restricted
Draper Prize	\$ 8,000,000	\$ 2,435,020
Gordon Prize	13,438,250	1,434,401
Capital Preservation	2,363,437	810,011
Hollomon	201,200	295,479
Great Achievements	—	123,655
Public Understanding	—	567,162
Technology and Environment	—	5,852
Frontiers Fund	—	149,905
Bueche Award	—	73,198
AT&T	—	37,827
CASEE	—	136,342
Russ Prize	—	4,892
Engineering Ethics Center	—	10,964
Diversity in the Engineering Work Force	—	2,674
Engineering Education	—	150,810
PUE Messaging	—	18,405
Grainger Prize	—	87,583
Hans Reissner	25,624	30,813
U.S./India Frontiers	—	45,064
Information Technology	—	24,636
Engineering & Services	—	2,749
Homeland Security	—	7,765
Communication with Public in Crisis	—	1,915
Industry Scholar	353,038	67,744
Senior Scholar	370,000	35,719
Young Engineer	778,641	68,530
Media Relations Mettler	—	64,530
Noise Policy Development	—	435,742
Urban Infrastructure	—	80,763
Offshore in UEF	—	30,426
China Project	—	100,000
Unrestricted contributions to be received in future years	—	603,405
Others	—	110,499
	\$ 25,530,190	\$ 8,054,480

Notes to Financial Statements (Continued)

NOTE D—PERMANENTLY AND TEMPORARILY RESTRICTED NET ASSETS (Continued)

Permanently and temporarily restricted net assets consist of the following at December 31, 2004:

	Permanently Restricted	Temporarily Restricted
Draper Prize	\$ 8,000,000	\$ 2,713,277
Gordon Prize	13,438,250	1,876,714
Capital Preservation	2,240,046	892,280
Hollomon	201,200	292,094
Great Achievements	—	165,337
Public Understanding	—	666,064
Technology and Environment	—	4,753
Frontiers Fund	—	16,250
Bueche Award	—	88,545
AT&T	—	9,508
CASEE	—	157,463
Russ Prize	—	52,619
Engineering Ethics Center	—	44,721
Diversity in the Engineering Work Force	—	64,537
PUE Messaging	—	37,986
Grainger Prize	—	325,373
Hans Reissner	25,624	32,377
Information Technology	—	23,791
Engineering & Services	—	2,688
Homeland Security	—	7,594
Communication with Public in Crisis	—	21,669
Industry Scholar	353,038	80,547
Senior Scholar	300,000	41,327
Young Engineer	768,641	87,609
Media Relations Mettler	—	218,628
Noise Policy Development	—	60,000
Urban Infrastructure	—	60,226
Unrestricted contributions to be received in future years	—	327,204
Others	—	120,684
	\$ 25,326,799	\$ 8,491,865

Notes to Financial Statements (Continued)

NOTE E—DESCRIPTION OF PROGRAM AND SUPPORTING SERVICES

The following program and supporting services are included in the accompanying financial statements:

Programs—programs that address relevant issues in the engineering field including, but not limited to: *Education, Engineering Practice and the Engineering Workforce; Engineering and the Environment; Engineering, the Economy and Society; Information Technology and Society; National Security and Crime Prevention; and Public Policy and Program Reviews.*

Member Programs—organization and administration of the Annual Meeting and publication of NAE Memorial Tributes.

Support for NRC and NAS—contributions to joint activities of the National Academies, including, but not limited to, the NAS/NAE/IOM Committee on Human Rights, the NRC Office of Scientific and Engineering Personnel, and *Issues in Science and Technology.*

Awards—NAE presents five awards: the Bernard M. Gordon Prize, the Charles Stark Draper Prize, the Fritz J. and Dolores H. Russ Prize, the Arthur M. Bueche Award, and the NAE Founders Award. Activities include soliciting nominations, selection of the recipients, announcement of the recipients and presentation of the prizes.

Fundraising—provides the structure necessary to encourage and secure private financial support from individuals, foundations and corporations.

Operations—includes the functions necessary to provide an adequate working environment, provide coordination and articulation of the Fund's programs, secure proper administrative function of the Board of Trustees, maintain competent legal services for program administration, and manage the financial and budgetary responsibilities of the Fund.

NOTE F—RELATED-PARTY TRANSACTIONS

The National Academies Corporation

The National Academies Corporation (TNAC) is a non-profit corporation that was incorporated in January 1986 for the purpose of constructing and maintaining a study and conference facility, the Arnold and Mabel Beckman Center, in Irvine, California, to expand and support the general scope of program activities of NAS, NAE, the Institute of Medicine (IOM), and NRC. TNAC is organized as a tax-exempt supporting organization for NAS and the Fund. The Board of Directors and officers of TNAC include certain officers of the Fund. The Fund had no transactions with TNAC for the years ended December 31, 2005 and 2004.

National Academy of Sciences and National Research Council

The Fund reimburses NAS by making monthly payments based on NAE's estimated expenditures for the year. This resulted in a payable to NAS at December 31, 2005 and 2004 of \$291,283 and \$2,545,709, respectively. Payments made to NAS by the Fund for the Fund's allocated portion of the expenditures shared jointly by NAS, NAE and IOM were \$1,145,214 and \$1,168,901 for the years ending December 31, 2005 and 2004, respectively. The Fund made no payments to NRC for the years ended December 31, 2005 and 2004. See Note A for the relationship of related parties.

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NAE PUBLICATIONS

NAE reports can be purchased from the National Academies Press, <www.nap.edu> or (888) 624-8373, or from the National Academies Bookstore, 500 Fifth Street, N.W., Washington, D.C.

All reports can also be read online.

Program Reports for 2005:

Building a Better Delivery System: A New Engineering/Health Care Partnership

Educating the Engineer of 2020: Adapting Engineering Education to the New Century

Engineering Research and America's Future: Meeting the Challenges of a Global Economy

Enhancing the Community College Pathway to Engineering Careers

Frontiers of Engineering: Reports on Leading-Edge Engineering from the 2004 NAE Symposium on Frontiers of Engineering

Rising Above The Gathering Storm: Energizing and Employing America for a Brighter Economic Future

Technological Options for User-Authorized Handguns: A Technology-Readiness Assessment

The Bridge, the NAE quarterly journal, is available from the NAE Program Office or on the NAE website <www.nae.edu/thebridge>.

The National Academy of Sciences is a private, nonprofit, self-perpetuating society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. Upon the authority of the charter granted to it by the Congress in 1863, the Academy has a mandate that requires it to advise the federal government on scientific and technical matters. Dr. Ralph J. Cicerone is president of the National Academy of Sciences.

The National Academy of Engineering was established in 1964, under the charter of the National Academy of Sciences, as a parallel organization of outstanding engineers. It is autonomous in its administration and in the selection of its members, sharing with the National Academy of Sciences the responsibility for advising the federal government. The National Academy of Engineering also sponsors engineering programs aimed at meeting national needs, encourages education and research, and recognizes the superior achievements of engineers. Dr. Wm. A. Wulf is president of the National Academy of Engineering.

The Institute of Medicine was established in 1970 by the National Academy of Sciences to secure the services of eminent members of appropriate professions in the examination of policy matters pertaining to the health of the public. The Institute acts under the responsibility given to the National Academy of Sciences by its congressional charter to be an adviser to the federal government and, upon its own initiative, to identify issues of medical care, research, and education. Dr. Harvey V. Fineberg is president of the Institute of Medicine.

The National Research Council was organized by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purposes of furthering knowledge and advising the federal government. Functioning in accordance with general policies determined by the Academy, the Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in providing services to the government, the public, and the scientific and engineering communities. The Council is administered jointly by both Academies and the Institute of Medicine. Dr. Ralph J. Cicerone and Dr. Wm. A. Wulf are chair and vice chair, respectively, of the National Research Council.

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