NATIONAL SCIENCE AND TECHNOLOGY COUNCIL (NSTC)

EXECUTIVE SUMMARY OF 1995 STRATEGIC PLANS

This document was prepared by the NSTC Executive Secretariat Office as a summary of the current activities of the NSTC Committees

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National Science and Technology Council

INTRODUCTION

The National Science and Technology Council (NSTC) was established by Executive Order 12881 on November 23, 1993. This cabinet-level council is the principal means for the President to coordinate science, space, and technology policies across the Federal Government. *An important objective of the NSTC is to establish clear national goals for Federal science and technology investments and to ensure that science, space, and technology policies and programs are developed and implemented to effectively contribute to those national goals.*

The NSTC, chaired by the President, includes the following members: the Vice President; the Assistant to the President for Science and Technology; the Secretary of Commerce; the Secretary of Defense; the Secretary of Energy; the Secretary of Health and Human Services; the Secretary of State; the Secretary of Interior; the Secretary of Agriculture; the Secretary of Labor; the Secretary of Transportation; the Secretary of Education; the Administrator of the National Aeronautics and Space Administration; the Director of the National Science Foundation; the Administrator of the Environmental Protection Agency; the Director of the Office of Management and Budget; the Director of the Central Intelligence Agency; the Director of the National Institutes of Health; the Director of the Arms Control and Disarmament Agency; the Assistant to the President for National Security Affairs; the Chair of the Council of Economic Advisers; the Assistant to the President of Economic Policy; and the Assistant to the President for Domestic Policy. This cabinet-level council reflects the stature that science and technology holds in this Administration. In accordance with one of the Vice President's National Performance Review recommendations, the NSTC is the outcome of a consolidation of the responsibilities previously conducted by a number of interagency councils, including the Federal Coordinating Council of Science, Engineering, and Technology (FCCSET), the National Space Council, and the National Critical Materials Council.

The NSTC is charged with pursuing an ambitious undertaking -- looking forward to the 21st century and projecting a vision and a strategy for the Federal R&D enterprise -- an enterprise focused on the national well-being of American citizenry in numerous dimensions, e.g. health, education, environment, and economic security. This ambitious

undertaking will also be the beneficiary of a partnership between the Federal and private enterprise -- a paradigm shift to work with various stakeholders at the outset and throughout the process of developing and implementing R&D strategies for the 21st century.

The NSTC established a structure of nine committees, as reflected by the diagram on the following page. Each committee published a 1995 Strategic Planning Document. This package consists of the Executive Summaries from the nine Strategic Planning Documents. Additional copies of this consolidated Executive Summary of all nine strategic planning documents may be obtained by contacting the NSTC Executive Secretariat Office at 202-456-6100. Electronic copies of the complete Strategic Planning Documents are available at the White House Office of Science and Technology Policy World Wide Web Home Page location (http://web.archive.org/web/19961107013524/http://www.whitehouse.gov/OSTP.html). To request a copy of the executive summary of an individual plan, send a blank electronic message to (REPORT-ABBREVIATION)-exsum@nstc.eop.gov

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COMMITTEE ON HEALTH, SAFETY & FOOD R&D

EXECUTIVE SUMMARY

PURPOSE

Improved health, safety and food security depends on scientific progress. CHSF will coordinate research and development, disseminate new knowledge, and support the development of sound and cost-effective national health, safety and food policies. CHSF plans an interactive mix of research and development investments that will improve our nation's health, safety and food, expand technological capabilities and stimulate growth. Fundamental scientific discovery will support technological development. Active surveillance will monitor current and emerging health, safety and food security issues. Knowledge-based evaluation will maximize program results and improvement. Multiple educational tools will inform the public about issues regarding their health, safety and food. CHSF scientists, fueled by accurate integrated information, will act on this plan in partnership with other dedicated professionals domestically and internationally.

THE CHALLENGE

CHSF is committed to developing the science base needed to meet complex challenges to health, safety and food security in a cost-effective manner. The U.S. science enterprise is at a juncture where rapid growth in science and technology can improve the health, safety and food of U.S. citizens, and national productivity, competitiveness, and economic security. The CHSF strategy supports "Science in the National Interest" by identifying research and development investments to help address national priorities such as health care quality and cost, welfare reform, food safety, violence and injury prevention, and improved health through proper nutrition and new medical treatments and technologies. The challenges we face include the following:

- Every day disease claims lives, causes suffering and costs money. For example, Alzheimer's disease currently affects 4 million Americans and costs about $90 billion annually. The cumulative costs of treating HIV-infected persons are forecast to increase 48% over the next three years.

- Health care spending has risen to 14% of the U.S. Gross Domestic Product, but by many indicators Americans are receiving less for their health care dollars than citizens of several other countries.

- Approximately 2/3 of premature deaths in the United States are the result of behavioral and environmental factors- many of which can be modified or prevented. Effective prevention can greatly reduce suffering and treatment costs. Injuries alone cost about $215 billion annually.

- The world population is expected to double by the year 2050. Growing demands for food and water need to be met. Abundant and safe food supplied through sustainable agricultural systems have many health, social,

environmental and economic benefits.

- In the United States, dietary factors and sedentary activity patterns have been identified as the second leading underlying cause of death, accounting for 14% of total deaths in 1990. Obesity is increasing- over one third of adults, or 50 million people are obese.

On November 21-22, 1994 the CHSF and OSTP sponsored a national forum: "Meeting the Challenge: Health, Safety and Food for America". The purpose of this Forum was to convene 450 scientific experts from a mix of disciplines, organizations and areas to review and improve CHSF plans, share ideas, and help develop and support our country's health, safety and food R&D objectives. The Forum endorsed the following priority areas: Biomedical, Socio-Cultural and Behavioral R&D; Health Systems and Services R&D; Health Promotion and Disease and Injury Prevention R&D; Food Safety, Security and Production R&D; and Human Nutrition R&D. In each area, planned R&D investments will yield positive returns, expand public and private capabilities, improve the nation's health, safety and food, and reduce the incidence and cost of disease and injury. CHSF plans in all areas were developed to optimize the focus, balance and interdisciplinary interaction of basic and applied research, technological applications, surveillance, evaluation, intervention and communication. Health, safety and food research and development also play an integral role in building strong industrial partnerships. These partnerships will transfer research into new biomedical and agricultural technologies, support economic growth and job training and development in areas like health systems and services; continue basic research and graduate education in all areas of health, safety and food research, and support global competitiveness and economic security in areas like agricultural and biomedical production.

The biomedical, socio-cultural and behavioral research strategy reflects recent assessments of Federal efforts to develop safe and effective HIV and cancer therapies, which have indicated that much basic research remains to be done. To improve health, research is needed on the biomedical, social, cultural, psychological and behavioral factors which influence individuals' exposure, susceptibility, treatment and recovery from disease. Variations in ability to comply with treatment regimens need to be better understood. The influences of social context, peer, family and community pressure in such situations also need to be better understood. Gender, socioeconomic, as well as racial/ethnic differences in disease incidence and prevalence must be examined

The health systems and services research strategy supports research on how to deliver more cost-effective mix of preventive, treatment and population-based health services to all population groups, and on research that enables citizens and other public and private decision-makers to make more informed decisions. For example, two recent clinical practice guidelines, addressing problems of low back pain and fluid in the inner ear of children, could reduce health care expenditures by more than $15 billion. It is clear that research and development investments on the effectiveness of the entire health care system, from clinical, preventive, and public health interventions to managerial, organizational, and financial strategies, coupled with research on the effective dissemination of these findings, can improve the value we receive for our health care dollars. It is also important to link existing public health and personal care data bases in the public and private sectors. This will call for an unprecedented level of Federal-State and public-private sector cooperation.

The health promotion and disease and injury prevention R&D strategy is to develop the knowledge base to manage and reduce the human and financial burden of preventable injury, disease and disability. This strategy will also provide individuals, communities and the government with the information they need to promote healthier lives, and to reduce disease, injury and disability. This strategy includes monitoring health problems, surveying health measures, developing and testing effective strategies, and strengthening individual and community involvement and responsibility for sustainable prevention.

The food safety, security and production research strategy is to meet the growing food needs of the nation and the world with a technology base for a sustainable system to efficiently produce and deliver abundant, safe, and healthful food to the public while strengthening the economy and contributing to ecosystem harmony. The strategy will focus on research to improve food safety and quality and to preserve, maintain, characterize and utilize the genetic resources of life forms important to food production.

The human nutrition research strategy is to enhance our knowledge of the critical role of diet and physical activity in human health and disease, and to support Americans in achieving healthier and more productive lives. The strategy will facilitate research and development coordination across agencies, help disseminate new knowledge to the public, and

support the development of sound national food and nutrition policies.

To be successful, strong partnerships among researchers and disciplines, across organizations, and with the public, industry, academia and government at all levels are required for a successful scientific enterprise that will support and cost-effectively expand national technological capabilities, economic growth and competitiveness. CHSF and forum participants have identified both CHSF-specific research and development initiatives and cross-cutting research and development issues that are important not only to CHSF but also to other NSTC committees. These areas are outlined below, and information on current and future CHSF agency activities is provided in this strategic planning document. CHSF will continue to refine these plans in the future.

RECOMMENDED CHSF-SPECIFIC R&D INITIATIVES

Human Nutrition Initiative-- This initiative includes research and development needed to achieve a healthier and more productive society through enhanced knowledge of the critical role of diet and physical activity in human health and disease. Diet is one of the leading risk factors for chronic diseases such as heart disease, cancer, stroke and diabetes. Over the past decade, obesity in the U.S. has increased dramatically. Now over one third of adults, or 50 million people, are obese. Research is needed to identify the causes of obesity, who is at risk, and how to reduce the incidence of obesity. The initiative will facilitate coordination across agencies, translation of new knowledge to the public, and development of sound national food and nutrition policies.

Health Systems and Services Initiative-- This initiative includes research and development needed to deliver a more cost-effective mix of preventive, treatment and population-based health services to all population groups. It would also provide information to enable citizens and other decisionmakers to make more informed health service decisions. This initiative includes research to increase the understanding of public and private decisionmakers on how to integrate population-based public health and personal care services, and on how to improve the balance between prevention and treatment. This initiative supports public and private innovation and reforms now underway in U.S. and international health care marketplaces by providing the information needed to improve private and public sector operations. This initiative also improves how research results are disseminated and used by consumers and policy-makers.

Genetic Resources for Food Initiative-- This initiative is a comprehensive program to preserve, maintain, characterize, and utilize the genetic resources of life forms important to food production. This research and development is needed to meet the growing food needs of the nation and the world with a technology base for a sustainable system to efficiently produce and deliver abundant and healthful food to the public while strengthening the economy and contributing to ecosystem harmony.

Food Safety and Quality Initiative-- This initiative includes research and development needed to assure the safety and quality of food for consumers. This initiative would include research and development to identify and reduce significant food-borne risks for human health, including surveillance and quality assurance. Research is needed to improve food processing technologies, sterilization and irradiation techniques, and waste management. This initiative supports research and development on compositionally enhanced foods and better understanding of how food components improve health.

Health Promotion and Disease and Injury Prevention Initiative-- Promoting health through preventing disease, injury and disability is a necessary companion to health care. Research and development in this area can reduce the human and financial costs of health care and long-term disability, and support increased individual and community responsibility and involvement. Expanded research and development is necessary in areas such as the following: vaccine development, emerging health threats, aggressive and violence-related behaviors, drug abuse and smoking, mental disorders, reproductive and child health, environmental and occupational health risks, chronic disease control, injury control and prevention.

CROSS-CUTTING R&D INITIATIVES INVOLVING OTHER NSTC COMMITTEES

The following cross-cutting initiatives are important not only to CHSF, but also to other NSTC committees.

Information Systems for Research and Decision-Making-- This includes the design, development and implementation of data systems for current and future R&D and surveillance needed to improve the nation's health,

safety and food. This includes national health, safety and food data systems needed to maintain active surveillance, collect national health statistics, monitor risks, fuel vital research, evaluate results and inform the public. This includes coordinating and integrating ongoing public and private data and information collection, and improving use of existing information and surveillance systems by expanding them to include factors such as environmental, behavioral, occupational and socioeconomic factors. The need to maintain, update, build, integrate and better use information systems necessary to conduct research, maintain surveillance, and evaluate performance is the single greatest obstacle to CHSF agency efforts. The systems need to be automated, linkable and accessible, as well as timely and complete.

Investing in the Research Continuum-The nation needs a multidisciplinary scientific agenda with a core of long term, high risk fundamental research that is interactively linked to applied research, clinical and field trials, technology applications, and marketed products. Private sector incentives to conduct fundamental research should be improved. Federally-supported research should be peer reviewed. This scientific agenda will enable the nation to use research results to support knowledge-based, cost-effective health, safety and food policies; and sustainable economic growth and competitiveness. Greater attention is needed to improve the interface between fundamental research, evaluation, information dissemination, and technology transfer.

Partnership for a New Generation of 21st Century Scientists-- This includes training and supporting creative investigators, especially beginning investigators, to conduct fundamental, applied and cross-disciplinary research on health, safety and food. This research drives the scientific enterprise. Maintaining the leadership position of the United States in the life sciences depends on producing outstanding beginning investigators and supporting an array of professional opportunities for them. This includes assessing the effectiveness of programs supporting beginning investigators.

Information Dissemination and Public Education (Science Literacy)-- A continuous effort to effectively communicate the results of research to the public is needed. This includes basic K12 science education in all areas of health, safety and food; science writing and reporting; a variety of electronic media, information resources, extension services, product labeling, and other targeted communications. Widely disseminating the results of research will increase the public's capability to make more informed personal choices, improve their health and make a difference in their daily lives.

Partnership for Human Productivity People are the world's most important resource. This research will clarify the processes that shape the intellectual, physical and emotional capacities of people. This includes multidisciplinary research to understand the biomedical, socio-cultural and behavioral factors that contribute to mental and physical health, as well as research that examines the interrelationships among individual action, family behavior, schools and other institutions. This partnership includes research on violence, and the Human Capital Agenda, which is intended to increase our understanding and ability to maximize human capacities, as well as violence-related research.

COMMITTEE ON INFORMATION AND COMMUNICATIONS R&D

EXECUTIVE SUMMARY

VISION

Building on more than forty years of both Federal and industrial investments in information and communications research and development, our nation leads the world in developing and applying this crucial technology for the 21st century. Today we stand at the threshold of its widespread dissemination throughout society, with the potential to revolutionize the way we live, learn, and work. While America leads the world in developing and applying information and communications technologies, the continued acceleration of technological change and the global recognition of the strategic value of these technologies means that any nation can make bold advances if it makes wise investments. At stake is the technology that will determine our Nation's ability to sustain its economic well being, to compete successfully in the global marketplace, and to enable affordable national security. The 21st century will be the Age of Information. Implementation and support of this plan will help ensure America's continuing preeminence in information technology as our country enters the 21st century.

This plan describes the mechanisms for continued coordination and implementation of interagency research programs and activities, and begins an important process of engaging industry, academia, and government to work together for the benefit of all Americans. As part of the NSTC, the Committee on Information and Communication's goal is to accelerate the evolution of existing technology and nurture innovation that will enable universal, accessible, and affordable application of information technology to enable America's economic and national security in the 21st century.

AGENDA FOR RESEARCH AND DEVELOPMENT

The Federal government has a crucial role to play in sustaining U.S. technological leadership in information and communications research. It supports (1) long-term scientific and technical research in information and communications that are the foundation for our Nation's 21st century industrial, commercial, and defense technologies; (2) university research that trains our country's future leaders in information and communications, science and engineering; (3) information and communications research and development needed to meet critical Federal missions; and (4) research and development in information and communications technologies that are critical to all of NSTC's overarching societal goals.

To efficiently exploit its long-term science and technology investments, it is essential that the government identify and coordinate its fundamental research strategies. The NSTC has embraced the six overarching societal goals to which all Federal science and technology programs must respond. To ensure that research and underlying technology development is fully responsive to enduser applications and to national goals, activities must be strategically focused and efficiently coordinated. Together with each of the agencies, the CIC has developed six Strategic Focus Areas to guide Federal research and technology investments in information and communications into the next century.

Strategic focus areas represent key opportunities to focus, coordinate, and accelerate information and communications science and technology development:

- Global-Scale Information Infrastructure Technologies
- High Performance/Scalable Systems
- High Confidence Systems
- Virtual Environments
- User-Centered Interfaces and Tools
- Human Resources and Education

The CIC's use of these interdisciplinary areas will efficiently focus the underlying R&D activities, which include research in components, communications, computing systems, support software and tools, intelligent systems, information management, and advanced prototype applications.

APPLICATION'S STRATEGY

The ultimate customers for information and communications R&D are the users of tomorrow's systems. Each agency's mission is linked directly to research in information and communications. Geographic distance, time to accomplish tasks, separation of people from resources, and outdated organizational structures are impediments that inhibit the ultimate achievement of all these goals Information technology has a pervasive and unprecedented ability to remove these barriers to progress. As part of the strategic planning process, CIC has identified three broad classes of user-driven applications: (1) high performance applications for science and engineering pushing the envelope of computational capabilities and enabling new discoveries in science and engineering; (2) high confidence applications for dynamic enterprises improving integration, privacy, security, and reliability of information flows within and across enterprises; and (3) high capability applications for the individual empowering individuals with universal, easy-to-use access information, and providing customization and support of their information space.

TODAY'S FOUNDATION AND BEYOND

Identifying future research directions in rapidly advancing technology areas requires continuous planning and evaluation. Building on the extraordinary successes of the interagency High Performance Computing and Communications (HPCC) program, this strategic plan sets forth a high level strategy for the Federal government's research and development investment in information and communications technologies. The HPCC investment in

science and technology forms the FY 1996 foundation of the CIC's plans for the future of information and communications research and development.

The CIC is following three principles to achieve success: (1) streamlined collaboration with industry and academia; (2) cooperative program management across agency bounds; and (3) collective support of agency programs. During the coming year, the vision, strategy, and projects described in this document will be brought to CIC's stakeholder communities, and detailed implementation plans developed to complement critical ongoing efforts. The CIC technical agenda will evolve rapidly, supported by long term, sustained commitment from the agencies. By focusing interagency cooperation, the Strategic Focus Areas will dramatically aid cooperative management when coupled to the baseline and complementary investments unique to each agency. In the coming year, the proven HPCC coordination structure will evolve to support ClC processes.

The diversity of applications across agencies, coupled with the commonality in basic information and communications research, highlights the critical importance of this strategic research agenda. These critical investments, integrated into the strategic planning process described here, will help ensure that America will continue to lead the world in the technologies essential to the Nation's success as we enter the age of information.

COMMITTEE ON NATIONAL SECURITY

EXECUTIVE SUMMARY

VISION

The vision of the Committee for National Security is to better couple science and technology to the full spectrum of U.S. national security: enhancing our military effectiveness, strengthening our economy, and fostering global stability.

The Strategic Implementation Plan addresses the Federal science and technology contribution to the President's national security strategy, *A Strategy of Engagement and Enlargement*. It is the product of the Committee for National Security, an interagency committee created to advise and assist the National Science and Technology Council in its mission to increase the overall effectiveness and productivity of Federal national security research and development efforts.

AREAS OF FOCUS

Support Our National Military Strategy-- The fundamental mission of national security science and technology is to support the ability of U.S. military forces to carry out our national military strategy. U.S. armed forces must maintain their readiness, flexibility and technological superiority to contend with a wide range of potential missions in the post-Cold War world, from major regional conflict through peace operations. The National Military Strategy is a key enabler to our broader national goals.

A strong science and technology base and a healthy industrial base are core ingredients of this defense capability. In the post-Cold War world, it is important that both be more closely integrated into the broader U.S. economy, to strengthen the application of broader technical capabilities to our defense needs and to ensure that our defense technology and industrial investment contribute to our national economic security and competitiveness.

As part of supporting our National Security Strategy, the Committee for National Security has identified three other priority missions of national security science and technology. These missions are highly intertwined:

Science and Technology Applications to Post-Cold War Missions-- Military missions at the lower end of the operational spectrum are of growing importance in the post-Cold War world. Our defense technology investment must be applicable to these new missions while also supporting our core regional military capability.

Building International Stability and Preventing Conflict-- Science and technology can play an important role in helping to prevent conflict before it requires the engagement of U.S. military forces.

Weapons of Mass Destruction--Technology plays a central role in efforts to ensure that we prevent and counter the proliferation of weapons of mass destruction and the means of their delivery, verify and monitor existing and new arms control agreements, and ensure the effectiveness of the smaller U.S. nuclear research and production capability.

In creating this plan, the Committee for National Security built upon a number of processes and studies to develop an integrated interagency approach to science and technology. Specific studies employed by the Committee on National Security include:

- Department of State Dispatch Supplement February 1994
- Deputy Secretary of Defense Report on Non/Counter Proliferation May 1994
- DoD Defense Science and Technology Strategy September 1994
- Committee on National Security Peacekeeping Paper October 1994

STRATEGY ELEMENTS

Our national security science and technology strategy is built on the following precepts:

Maintain Technological Superiority-- Technology superiority underpins our national military strategy as articulated by the Joint Chiefs of Staff. Although the Cold War threat has changed, we remain committed to technological superiority precisely because it allows us to field the most potent military forces at the lowest cost both economic and human.

Invest Broadly in Basic Research-- Our strategy is to apply resources broadly at the basic research level and make further investment decisions as emerging technologies reveal the most promising payoff areas.

Use Commercial Technology Where Possible-- It is commercial demand that drives development of many defense-critical technologies. Partnerships with industry can capture those commercial technologies that present the greatest potential military application.

Incorporate Affordability-- The cost of advanced technology systems must not be allowed to spiral upward uncontrolled. Affordability must be designed in from the beginning.

Access International Science and Technology-- International cooperation in science and technology can serve our interests by augmenting our own investment and by enhancing our industrial competitiveness.

Address Global Problems at the Root of Conflict-- Science & Technology can play a role in addressing global problems and helping to advance democracy and foster international stability.

Mobilize Resources in an Enhanced Interagency Fashion-- The Committee for National Security fosters coordination and collaboration among agencies in pursuing the national security science and technology program.

COMMITTEE ON CIVILIAN INDUSTRIAL TECHNOLOGY

EXECUTIVE SUMMARY

STRATEGIC IMPLEMENTATION PLAN

Technological innovation drives economic growth. It is a powerful force for the creation of good jobs and a steady rise in living standards. With the end of the Cold War, the globalization of the world economy, and the explosion of new information and manufacturing technologies, technology is more dominant than ever in raising productivity and

achieving world-class industrial performance. Change at such an accelerating pace can be a source of anxiety and uncertainty; but government, working in partnership with industry, can instead make it a source of enormous opportunity for America.

While the private sector plays the major role in applying technology to economic growth, the government also has an indispensable part to play. Three fundamentals for technology-based growth are first-class education and training for all Americans, a strong fundamental science base, and a business environment conducive to investment in research and innovation. All require effective government policy. But they must be augmented by an innovation system that moves emerging and enabling technologies from the science base to products and services in a timely and effective manner. In some instances, government investment in partnership with industry can be critical to the early precompetitive development of civilian technology. Where the costs of investing in new technologies are very high and the rewards distant and especially where benefits to other firms and society at large are likely to outstrip returns to the individual investing company private investment is usually inadequate. For advances in this kind of high-risk, high-payoff technology, government can share the risk and create benefits that reach beyond individual firms. In addition, government can provide connections between the science establishment, the education community, government science and technology programs, and private industry.

For half a century after World War II, Federal science and technology policy was mostly limited to support of fundamental science and traditional government missions - chiefly national security, health, and space. These investments benefited American industry, and seemed adequate at a time when U.S. firms dominated the world economy. Today we live in a different world. Tough international competition has forced corporate cost-cutting drives, leading companies to target in-house research on technologies that are close to commercialization at the expense of longer term or riskier research. Moreover, the accelerating pace of technological advance, ever shorter product cycles, and rapid worldwide diffusion of technologies make it still harder for many companies to invest adequately in risky or long-term R&D. The new model of best practice that is taking form is to create partnerships for riskier or more generic R&D teaming with other companies, with universities, and with the government.

The Committee on Civilian Industrial Technology (CCIT) of the National Science and Technology Council (NSTC) is responsible for oversight and coordination of government-wide R&D and allied technology programs that promote industrial competitiveness and economic growth. This document describes the purpose and activities of CCIT.

The major purpose of the CCIT is to ensure that the government's R&D resources relevant to industrial competitiveness are used efficiently and effectively. To meet the dual goals of deficit reduction and investment in the Nation's future, R&D investments must be designed to get the greatest possible leverage. Better coordination and management to see that priority areas receive proper attention is the way to reach these goals.

Collaboration with private industry is central to CCIT activities. Industry brings to the table crucial market experience in selecting areas for technology investment. For its part, government can provide a long-term outlook, support for enabling technologies (such as standards and measurement) that benefit industry broadly, and reduction of risk in investments with potentially high social payoffs but questionable returns to individual companies. In addition, government can act as convener in bringing together efforts that individual companies cannot accomplish on their own. Government- industry partnerships for these purposes have had broad support for many years in several areas (agriculture, civilian aircraft, and standards and metrology). And since 1980, bipartisan legislation has encouraged R&D partnerships in wider areas, including technology transfer from Federal laboratories to industry and collaborative R&D for precommercial technology development.

Principles governing industry-government civilian technology partnerships include:

- industry leadership
- cost-sharing
- competitive selection, on the basis of merit, of cost-shared projects
- evaluation of partnership programs to determine their success
- mechanisms for ending programs when goals are accomplished

While all the programs coordinated by CCIT have the central purpose of promoting economic growth, they also include public benefits that are external to the market, and they differ in emphasis. Some activities focus on enabling

technologies that apply across a broad range of industries. CCIT's subcommittees on Manufacturing Infrastructure and Materials Technology are in this category; included here are programs to diffuse best-practice technologies broadly to small and medium-sized firms. Other activities are more focused on technologies of interest to particular industrial sectors, where industry leaders see a clear need for cooperation with government R&D to solve technology problems. These include: the Partnership for a Next Generation Vehicle, the National Electronics Manufacturing Initiative, and the Building and Construction Initiative.

In addition, the Advanced Technology Program (ATP) is an industry-led, cost-shared, merit-based partnership program that supports a range of technologies relevant to the health and growth of several important industrial sectors, including those that are the focus of CCIT initiatives. The Technology Reinvestment Project (TRP) also relies on industry leadership, cost sharing, and competitive selection in a partnership aimed at making the most advanced and affordable commercial technologies available to the military. Both ATP and TRP are high-priority programs for the Clinton Administration.

CCIT also joins with other NSTC Committees in coordinating activities that cut across several committee responsibilities, including environmental technologies, biotechnologies, and dual-use technologies that have important applications in both military and civilian spheres.

Government partnerships with industry for technology advance are of course just one element in what is needed for the United States to take and hold world leadership in important industries that add to the national wealth, create good jobs, and enrich our lives. The "environment conducive to private investment," alluded to above, includes some overarching policy areas. At the top of the list is reduction of the Federal deficit, so that massive government borrowing does not push up the cost of capital and crowd out private investment. Other important elements are tax policies with appropriate incentives for private investment; trade and export policies that open foreign markets to U.S. goods; and regulation by performance, not prescription, for protecting public health and the environment. The Clinton Administration has accomplished a great deal in these areas, but significant challenges still lie ahead.

Equally important is first-class education that challenges and rewards all our children, and lifelong learning opportunities for adults. Although these activities are outside the scope of CCIT (they are covered in the NSTC Committee on Education and Training), they are closely linked to the success of civilian industrial technology efforts. The Clinton Administration has made strides in this direction; e.g., in the School-to-Work Transition program, for young people who do not choose a straight path to college. Clearly, however, further progress is needed toward world-class education and training in the United States. New, more collaborative approaches can contribute to the adoption of new technologies. In addition to training workers to use and operate new technologies, industry should involve workers in new technology design, purchasing, and the integration of technologies into innovative work systems. These are major challenges for improving competitiveness, and bringing home to all Americans the benefits of technology advance.

COMMITTEE ON FUNDAMENTAL SCIENCE

EXECUTIVE SUMMARY

STRATEGIC IMPLEMENTATION PLAN

The Federal investment in fundamental science serves two principal purposes: (1) developing a knowledge base that supports agency and national requirements for science and technology underpinning important areas of national policy, and (2) assuring a vital, regenerative pool of people, ideas, knowledge and tools to draw upon in addressing the scientific and technical challenges of the present and the future. The work and plans of the Committee on Fundamental Science Research (CFS) center on the second of these purposes, focusing on long-term investments that are efficient and effective in their use of current resources and in their connection with current challenges and opportunities.

Science in the National Interest, the recent Presidential statement of science policy, builds on a decade of public and private sector thinking about the role of science and technology to articulate a substantive set of challenging goals for

the investment in fundamental science. At the same time, it paints a persuasive picture of the value of fundamental science in addressing aspects of many pressing policy issues in areas such as health, prosperity, national security, environmental responsibility, and improved quality of life. It provides the rationale for a national effort to attain the following goals:

- Maintain leadership across the frontiers of scientific knowledge.
- Enhance connections between fundamental research and national goals.
- Stimulate partnerships that promote investments in fundamental science and engineering and effective use of physical, human, and financial resources.
- Produce the finest scientists and engineers for the twenty-first century.
- Raise scientific and technological literacy of all Americans.

CFS faces the following challenges:

- Establishing a government-wide mission for and approach to fundamental science; and
- Developing a cross-agency strategy for dealing with foundational issues that affect the broad research and development enterprise.

CFS must embrace these challenges within the context of agency missions and broad administration priorities, and develop a federated structure to facilitate interagency cooperation.

In the course of developing data on the FY 1996 Budget, CFS undertook an analysis of the level of funding for fundamental science, agencies' priorities for the immediate future, and how they describe their mission for fundamental science. In sum, the Federal portfolio in fundamental science is on the order of $20 billion, approximately 27 percent of the total Federal research and development effort. This is large relative to the portfolios being coordinated by other NSTC committees, and, because of the links to those portfolios, presents a complex web of interactions that must be addressed in developing an interagency approach to fundamental science.

Strengthening the Federal investment for fundamental science in the near term must be accomplished in an environment of an overall Federal budget for discretionary spending that is static or even declining. To sustain modest real growth over the next five years, consistent with the recommendations of Science in the National Interest, will require significant changes in the frameworks within which agencies make priority decisions. To make up ground lost since the FY 1993 base used in *Science in the National Interest* would entail wrenching decisions that give priority to enhancing long-term investments across the government.

CFS is committed to providing the framework for decision making and the cogent rationale that would make such decisions possible. It will encourage agencies to risk increasing their long-term investments, even at the cost of the short-term. And it will support the agencies in the interactions with the Congress necessary to implement the decisions.

Principles and guidelines for establishing priorities under this approach include investments in:

- fundamental science research at the nation's colleges and universities;
- merit review with peer evaluation;
- areas consistent with a particular agency's overall mission and its role in fundamental science;
- fundamental science tied to broad national goals through joint activity with interagency initiatives coordinated by other NSTC committees;
- dedicated interagency research efforts where national goals require common tools, approaches or ideas from fundamental science;
- a balanced portfolio for world leadership;
- access to and use of academic and government facilities for research and education; and
- advancing science, mathematics, and engineering education.

The coordinated approach planned by CFS will help the nation achieve an effective, accountable portfolio of investments in fundamental science that will keep the United States at the cutting edge of science and technology. Traditionally, Federal agencies have set their goals and priorities in fundamental science independently. Current resource constraints require that we optimize the overall balance in the national portfolio of investments, while

maintaining the independence of each agency's operation that has contributed so much to the quality of the total effort.

COMMITTEE ON INTERNATIONAL SCIENCE, ENGINEERING & TECHNOLOGY

EXECUTIVE SUMMARY

STRATEGIC IMPLEMENTATION PLAN

The Committee on International Science, Engineering and Technology (CISET) addresses international scientific cooperation as it relates to foreign policy and the nation's research and development agenda. The main function of CISET is to develop, on an interagency basis, policies for furthering international S&T cooperation in the national interest. CISET activities are directed towards three broad, complementary goals:

1. To identify and coordinate international cooperation that can strengthen the domestic S&T enterprise and promote U.S. economic competitiveness and national security.

2. To utilize American leadership in science and technology to address global issues, and to support the post-Cold War tenets of U.S. foreign policy promoting democracy, maintaining peace, and fostering economic growth and sustainable development.

3. To coordinate the international aspects of Federal R&D funding across the Federal agencies.

Science and technology are global enterprises. This presents both opportunities and challenges in developing S&T policy through the National Science and Technology Council (NSTC). The internationalization of science offers many exciting opportunities, since some of today's most difficult scientific and technological problems cannot be solved by the United States (or any country) acting alone. The intellectual and financial resources needed to address such issues as protecting the environment, developing sustainable energy sources, or identifying the fundamental structure of the Universe, can only be mustered on the basis of international cooperation. Many parts of the U.S. scientific agenda inherently require international cooperation, for example, the study of the causes and effects of global climate change. Other parts of the agenda naturally invite collaboration because of unique foreign expertise or facilities.

American scientists and engineers are playing a vital role in addressing some of the most pressing global problems that, in the long run, can represent a threat to the United States: environmental degradation, new and reemerging diseases, rapid population growth and food scarcity. International engagement also allows American scientists and engineers to become familiar with foreign technology, and to help establish the basis for the export of American technology-based products and services.

Participation in international collaborative projects, particularly in technologies with defense and economic applications, requires careful analysis, planning and interagency coordination. On one hand, higher levels of international cooperation support continuing U.S. leadership in S&T. On the other hand, this cooperation must serve the national interest: the advancement of U.S. economic competitiveness, global stability, sustainable development and other elements of national security.

Unlike most of the other eight NSTC Committees, CISET's mandate is not defined within any particular area of science or technology. The technical agencies of the U.S. government engage in a wide range of bilateral and multilateral international scientific programs that support their missions. The role of CISET is to review these activities, and to identify opportunities for international cooperation and interagency coordination in response to new needs and opportunities. In addition, CISET serves as a forum for establishing government policy on specific problems and issues that arise in the international S&T arena.

CISET has formed subcommittees in three areas: (1) international budget priorities, (2) opportunities and obstacles in international cooperation, (3) science, technology and global issues. The subcommittees have undertaken the following

activities:

- Developing new follow-on arrangements for the OECD Megascience Forum.
- Reviewing and coordinating research and development for international population stabilization.
- Developing a science and technology initiative for the Summit of the Americas.
- Removing obstacles to U.S./Russia S&T cooperation.
- Considering international exchange of meteorological data in light of U.S. policy on access to global change data.
- Reviewing research and development for international food security and nutrition.
- Coordinating a response to the global challenge of emerging and reemerging infectious diseases.
- Setting strategic objectives for S&T cooperation with selected countries.
- Ensuring adequate protection for intellectual property rights (IPR) in international cooperative science programs.
- Organizing a public forum on international science and technology.

Within a month of his inauguration, President Clinton articulated a strong commitment to continued American excellence in science and technology. In the document Technology for America's Economic *Growth, A New Direction to Build Economic Strength*, the President enumerated his top priorities, among them "*International science and technology cooperative projects that enhance U.S. access to foreign sources of science and technology, contribute to the management of global problems, and provide the basis for marketing U.S. goods and services.*" The CISET process was established to assist in the practical implementation of the President's policy. In its first year of operation, CISET has provided an interagency forum for reviewing, coordinating and facilitating Federally-funded international R&D.

COMMITTEE ON ENVIRONMENT & NATURAL RESOURCES

EXECUTIVE SUMMARY

STRATEGIC IMPLEMENTATION PLAN

Scientific research and technological development are critical for enhancing environmental quality, improving our nation's economy, and protecting the health of our citizens. The most challenging environmental issues facing society today range from local to regional and global, including sustainably using and managing our natural resources; maintaining biological diversity; maintaining a safe water resource; improving air quality; reducing exposure to toxic substances; limiting hazards from natural disasters (e.g., geological and weather-related hazards), understanding climate change, and minimizing ozone depletion.

Addressing these complex issues requires integration of the social and natural sciences as well as increased emphasis on areas, such as developing science policy tools to improve risk assessment, and new, more cost-effective environmental technologies.

This interagency plan focuses the Federal R&D dollars on our most pressing societal needs. Significant changes in the way the Federal government plans and supports environmental and natural resources research and development are under way. This Administration has:

- Reinvented R&D in the Federal government by creating the cabinet-level National Science and Technology Council (NSTC) to establish clear national goals for Federal science and technology investments. The NSTC, through the Committee on Environment and Natural Resources (CENR), is coordinating interagency programs among 12 agencies and is focusing environmental and natural resource R&D on those questions that most directly impact our health and our economy.

- Replaced traditional single-issue, single-agency, single-discipline problem solving with a coordinated, multiagency, interdisciplinary approach that brings together natural and social scientists, economists, engineers, and policy-makers. The CENR provides clear leadership through its subcommittee structure for strategic planning, coordination, and prioritization of research and assessment objectives across all Federal agencies.

R&D priorities have been developed in concert with a wide range of stakeholders from academia, industry, other private sector groups, and state and local governments. By taking full advantage of this nation's enormous scientific and technological resources, critical gaps in our understanding of important environmental issues can be identified and filled and the key issues of the future anticipated.

The CENR is strengthening the overall Federal R&D program through:

- increasing emphasis on competitive awards and on peer and merit review for Federally funded R&D;
- improving the links between research and policy, ensuring that research programs are anticipatory to prevent, not just mitigate, environmental threats;
- taking a leadership role in international scientific efforts by leveraging our research through international agreements and programs; and
- developing performance standards to evaluate research program effectiveness.

As a result of the process of developing strategic and implementation plans for the CENR, the following areas of research have been identified for enhanced emphasis in the research and budget planning cycles of the CENR Federal agencies with environment and natural resources research:

- **Ecosystem research**-- to promote the efficient use of natural resources while sustaining ecosystem integrity for future generations.
- **Observations and data management**-- to ensure that the necessary measurements are made efficiently and that the data are widely available to all stakeholders in easily usable forms.
- **Socioeconomic dimensions of environmental change**-- to understand the underlying human influences on the environment and the potential responses of society to change.
- **Environmental technology**-- to protect the environment while stimulating economic growth and capturing emerging global markets.
- **Science policy tools**-- to improve integrated assessment and risk models so policy-makers can make informed decisions on complex environmental and societal issues.

The information gained from the NSTC process was used to redirect and prioritize resources in FY 1996. Twelve agencies propose $5.5 billion in environmental funding for 1996, an increase of $187 million, or 3.5 %, over the 1995 level. This level of funding would allow us to place increased emphasis on the five areas identified as high-priority.

Some Examples of How Investment in R&D Pays Off:

- We are saving lives through improved predictions of severe storms based on meteorological observations and models, as well as through better early warning systems
- We are strengthening the economy by stimulating new areas in biotechnology and by commercializing new technologies in pollution prevention.
- We are protecting the health of our citizens by reducing exposure to toxic substances in air and water, and by preventing dangerous levels of ultraviolet radiation from reaching the Earth's surface by controlling chlorofluorocarbons (CFCs) and halons.

Preparing for the Future Through Science and Technology: An Agenda for Environmental and Natural Resource Research is a progress report on the first stages of this evolving, multiagency, interdisciplinary journey to reinvent how Federal science agencies do business to enhance environmental quality and economic growth.

COMMITTEE ON TRANSPORTATION R&D

EXECUTIVE SUMMARY

STRATEGIC IMPLEMENTATION PLAN

This summary of Federal transportation research and development priorities has been prepared for the National Science and Technology Council (NSTC) by the NSTC Committee on Transportation R&D and the Office of Science and Technology Policy. The plan reflects current progress in the ongoing effort to assess Federal transportation research and to develop long-term R&D programs integrated across agencies in specific transportation-related areas of common interest. The plan was compiled from subcommittee reports which contain extensive additional detail concerning agency programs, goals, issues and resources. Efforts of the Committee in 1994 focused on identification of perceived R&D gaps and opportunities. The following objectives were developed for coordinated public and private R&D:

Physical Infrastructure for Transportation: Develop materials, design methods, nondestructive testing techniques, and other technologies for low-cost, long-lasting highways, bridges, airports, and other structures. Develop low-cost methods for nondestructive testing and repair of existing structures.

Information Infrastructure for Transportation: Apply the innovations available from the national information infrastructure to develop an Intelligent Transportation System that will ensure the safe and efficient intermodal operation of the nation's vehicles and physical infrastructure.

Next-Generation Transportation Vehicles:

- Aeronautics: Maintain world leadership in aircraft, engines, avionics, and air transportation system equipment for a safe, sustainable, global aviation system.

- Space Launch: Ensure reliable and affordable access to space through a stronger US space launch capability which meets the needs of the civilian, national security, and commercial sectors.

- Personal (Light-Duty) Motor Vehicles: Renewed leadership in automotive technologies through the development of a new generation of energy efficient, low emission vehicles that will preserve American jobs and improve American competitiveness.

- Medium and Heavy Duty Motor Vehicles (Trucks and Buses): Ensure US leadership in truck and bus technology by investing in improved materials, components, and design concepts and other technologies required for improved accessibility, energy efficiency and environmental characteristics.

- Rail Vehicles (Intercity and Transit): Position the US as a world technology leader and primary exporter of rail-related equipment and services by facilitating technological innovation in rail vehicle design and construction and by introducing advanced materials, and communications and control technologies which will result in improved performance and reduced costs.

- Ships and Shipbuilding: Restore the competitiveness of the US in ship building, ship repair, ship design, and ship production in order to ensure a strong and competitive US shipbuilding industry unsurpassed in building the finest and most complex vessels in the world.

Transportation System Design, Planning, Management and Operations

- Transportation System Assessment Tools and Knowledge: Develop information required for government and industry managers to make effective decisions about the safe operation of existing transportation systems as well as new investments.

- Human Performance in the Transportation System: Define appropriate roles for the human-in-the-loop through human-centered automation and improve the safety and competitiveness of American products through the integration of human performance principles and procedures and the application of new information dissemination, communication, and display technologies to transportation.

These objectives provide the foundation for generation in 1995 of detailed and comprehensive description of Federal transportation R&D goals, plans, measures, budgets, and priorities, including active coordination with relevant other NSTC committees.

The purpose of this report is to highlight ongoing Federal research efforts in this science and technology (S&T) field and to identify new and promising areas where there might be gaps in Federal support. The report is intended for internal planning purposes within the Federal agencies and as a mechanism to convey to the S&T community the types of research and research priorities being sponsored and considered by the Federal agencies. The Administration is committed to a broad range of high priority investments (including science and technology), as well as to deficit reduction, and to a smaller, more efficient Federal government. These commitments have created a very challenging budget environment- requiring difficult decisions and a well thought-out strategy to ensure the best return for the nation's taxpayer. As part of this strategy, this document does not represent the final determinant in an overall Administration budget decision making process. The research programs presented in this report will have to compete for resources against many other high priority Federal programs. If these programs compete successfully, they will be reflected in future Administration budgets.

COMMITTEE ON EDUCATION AND TRAINING R&D

EXECUTIVE SUMMARY

The most important measure of success for the National Science and Technology Council (NSTC) will be its ability to make improvements in the lives of Americans. Few enterprises touch the lives of as many people as do those concerned with education and training. High-quality education and training benefit the individual whose knowledge and skills are upgraded, the business seeking a competitive edge, and the Nation in achieving overall productivity and increasing competitiveness in the global marketplace. It is essential that all Americans have access to the education and training they need and that the teaching and learning enterprise itself becomes a high-performance activity.

In recognition of the importance of education and training and of the necessity of bringing to bear the talent and coordinated resources of all the Federal agencies to create productive and successful education and training enterprises that support the lifelong learning needs of all Americans the NSTC created the Committee on Education and Training (CET).

The CET was established to advise and assist the NSTC in coordinating and increasing the effectiveness and productivity of Federal efforts in education and training. Its purpose is to:

- Coordinate Federal research and development in education and training;
- Promote the use of technology to enhance lifelong learning; and
- Promote excellence in science, mathematics, and engineering education at all levels.

VISION

To coordinate and focus Federal efforts in education and training so that they become a powerful force in helping Americans meet the challenges of the 21st century.

STRATEGIC IMPLEMENTATION PLAN

The CET has developed its Strategic Implementation Plan to guide Federal efforts in education and training in accord with principles established by the National Education Goals as delineated in the "Goals 2000: Educate America Act," the National Science Goals as expressed in "Science in the National Interest," and the National Information Infrastructure Agenda for Action. The Plan provides a framework for making cross-agency policy, programmatic, and budgetary decisions, and for assessing the impact of these decisions. This framework centers on the vision and goals of the two subcommittees the CET has formed to meet its responsibilities. The two subcommittees are: The newly formed Subcommittee on Research and Development in Education and Training, and the Subcommittee on Excellence in Science, Mathematics and Engineering Education,

continuing work started in 1990. Their visions, goals, objectives, and activities are outlined in this Plan.

RESEARCH AND DEVELOPMENT IN EDUCATION AND TRAINING

The vision for research and development in education and training is:

Ensuring all Americans access to quality education and training tailored to their individual learning and workplace needs.

GOALS

The goals for research and development are to:

1. Provide National leadership in guiding education and training in its evolution toward the 21st century;

2. Develop a research and development agenda for achieving the National Education Goals by the end of the decade;

3. Promote increased resources for research and development in education and training; and

4. Promote partnerships for demonstrating and deploying cost-effective learning technologies and techniques.

OBJECTIVES

- Identifying and exploring areas of research and development that significantly improve learning;
- Coordinating the design and implementation of evaluations to assess the effectiveness of new education and training technologies and techniques;
- Identifying, demonstrating, and implementing exemplary models of cost-effective education and training;
- Making information on learning, research, and existing tools and techniques widely available; and
- Enhancing collaboration through interagency, intergovernmental, and industry partnerships that increase learning productivity for all Americans.

ACTIVITIES

Activities of research and development are organized around four focus areas:

- Demonstrating innovative technology and networking applications;
- Developing new models for evaluating learning and learning productivity;
- Developing high-quality, affordable learning tools and environments; and
- Promoting research on learning and cognitive processes.

EXCELLENCE IN SCIENCE, MATHEMATICS, AND ENGINEERING EDUCATION

The vision for excellence in science, mathematics, and engineering education is:

Achieving an American performance in science, mathematics, engineering, and technology in the classroom and the workplace that is second to none.

GOALS

The goals for excellence in science, mathematics, and engineering education are:

1. By the year 2000, all students will leave grades 4, 8, and 12 having demonstrated competency over challenging subject matters, including science and mathematics;

2. By the year 2000, the Nation's teaching force will have access to programs for the continued improvement of their professional skills and the opportunity to acquire the knowledge and skills needed to instruct and prepare all American students for the next century:

3. By the year 2000, United States students will be the first in the world in mathematics and science achievement;

4. By the year 2000, 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.

5. Produce the finest scientists and engineers for the 21st century.

OBJECTIVES AND ACTIVITIES

Objectives and activities for excellence in science, mathematics, and engineering education are organized around the following eight focus areas:

- Encouraging science as a core requirement for grades K-16;
- Promoting systemic reform of K12 standards-based science, mathematics, technology, and engineering education;
- Promoting a competent and contemporary undergraduate science, mathematics and engineering enterprise for a diverse student population;
- Promoting graduate and postdoctoral science and engineering education/training commensurate with human resource requirements;
- Promoting a competent, contemporary, and diverse scientific and technical work force;
- Focusing interagency programming on science and mathematics supported by technological education to ensure work force competency in a rapidly changing economy;
- Promoting Federal efforts to enhance public understanding of science and apply technology to lifelong learning; and
- Promoting efforts to determine the effectiveness of Federal investments in science, mathematics, engineering, and technology education and training programs.

BENEFITS

The Federal Government as both a customer and partner of the Nation's work force has a direct stake in the quality of education and training in America. In assuming its leadership role, the Federal Government is highlighting national challenges, mobilizing national support, and building partnerships involving Federal, State, and local governments, business and industry, professional associations and community-based organizations that will meet the challenges of the next century.

This Plan addresses the entire spectrum of education and training from preschool activities through higher education, workplace training, and lifelong learning. Its infusion of new education and training capabilities that are now available from advances in learning technologies will ensure an acceleration toward fundamental reform. It will promote private sector interest in increasing the quality and lowering the cost of learning materials. It will provide nationally visible evidence of the value and practicality of learning technology and the essentiality of paradigm shifts needed to ensure

learning productivity.