

Mechanical Engineering in the FY 2001 Budget

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INTRODUCTION

The information in this chapter relates specifically to programs with significant mechanical engineering components. Table 1 summarizes the FY 2001 funding requests for mechanical engineering-related research and development (R&D) in eight federal agencies. A more detailed breakdown of individual agencies' R&D budgets and analyses follow.

Table 1: Summary of Mechanical Engineering-Related Programs in the Federal Budget (in millions of dollars)

	FY 1999 Budget	FY 2000 Estimate	FY 2001 Request
Department of Defense	7,574.0	8,392.0	7,542.0
Department of Energy	2,578.0	2,478.2	2,895.7
Department of Transportation	597.0	606.0	777.0
Environmental Protection Agency	*	149.7	143.6
National Aeronautics and Space Admin.	*	5,041.0	5,289.0
National Institutes of Health	654.2	661.6	*
National Institute of Standards and Technology	579.1	524.0	671.9
National Science Foundation	197.3	204.8	243.3

* Figures not available

DEPARTMENT OF DEFENSE (DOD)

Proposed FY 2001 funding for the DOD Science and Technology (S&T) Program is \$7.5 billion, 11.3 percent lower than the FY 2000 appropriated levels. Applied Research (category "6.2") and Advanced Technology Development ("6.3") are down \$266 million (8.4 percent) and \$644

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million (20.2 percent), respectively. Individually, the largest declines would be in the Army and Navy Advanced Technology Development (“6.3”) at 39.3 percent and 39.8 percent, respectively. Defense-wide Applied Research has the largest proposed increase (17.1 percent). Basic research (category “6.1”) has a proposed increase of \$56 million, or 4.8 percent, which, along with the FY 2000 enacted increase, would reverse a seven-year decline in DOD funding for basic research.

The DOD S&T program contains elements incorporating significant mechanical engineering research. Increases are proposed for counter-terrorism, improvements in the safety and security of the nation’s physical information technology (IT) infrastructure, advanced nano-materials, advanced “bottom-up” manufacturing, and innovative power sources.

Table 2: Detail of Selected Mechanical Engineering-Related Programs in the FY 2001 Budget (in millions of dollars)

	FY 1999 Budget	FY 2000 Estimate	FY 2001 Request
Department of Defense (DOD)			
Air Force			
Basic Research (“6.1”)	198.0	214.0	206.0
Applied Research (“6.2”)	*	597.0	590.0
Advanced Technology Development (“6.3”)	*	577.0	495.0
Army			
Basic Research (“6.1”)	177.0	204.0	201.0
Applied Research (“6.2”)	*	791.0	602.0
Advanced Technology Development (“6.3”)	*	684.0	491.0
Navy			
Basic Research (“6.1”)	354.0	374.0	397.0
Applied Research (“6.2”)	*	622.0	527.0
Advanced Technology Development (“6.3”)	*	750.0	539.0
Defense-Wide (DARPA; DOD Labs)			
Basic Research (“6.1”)	335.0	368.0	413.0
Applied Research (“6.2”)	*	1,400.0	1,424.0
Advanced Technology Development (“6.3”)	*	<u>1,811.0</u>	<u>1,657.0</u>
Total DOD	7,574.0	8,392.0	7,542.0
Department of Energy (DOE)			
Basic Energy Sciences	796.0	779.4	1,015.8
Energy Supply	770.0	730.9	829.1
Fossil Energy	384.0	403.9	375.6

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Energy Conservation	<u>628.0</u>	<u>564.0</u>	<u>675.2</u>
Total DOE	2,578.0	2,478.2	2,895.7

Department of Transportation (DOT; please see Table II-15)

Environmental Protection Agency (EPA)

Superfund Tech Support	*	37.5	35.9
Global Risks	*	20.6	22.7
Tropospheric Ozone Research	*	6.3	8.5
Air Toxics Research	*	18.1	17.4
Pollution Prevention	*	27.4	19.5
Environmental Tech. Verification	*	6.4	6.7
Environmental Monitoring & Assessment	*	30.5	30.2
Science Advisory Board	*	<u>2.9</u>	<u>2.7</u>
Total EPA	*	149.7	143.6

National Aeronautics and Space Administration (NASA; please see Table II-12)

National Institutes of Health (NIH)

NIH Bioengineering	654.2	661.6	*
- <i>NIDCR Bioengineering</i>	*	55.4	*

National Institute of Standards and Technology (NIST)

Industrial Technology Services (ITS)			
Advanced Technology Program (ATP)	197.4	142.6	175.5
Manufacturing Extension Partnership (MEP)	106.8	104.2	114.1
Institute for Information Infrastructure Protec.	0.0	0.0	50.0
Scientific and Technical Research	<u>274.9</u>	<u>277.2</u>	<u>332.3</u>
Total NIST	579.1	524.0	671.9

National Science Foundation (NSF)

Chemical and Transport Systems	41.9	44.3	54.4
Design, Manufacture and Indus. Innovation	45.3	47.3	58.7
Engineering Education and Centers	62.0	65.0	74.0
Civil and Mechanical Systems	<u>48.1</u>	<u>48.2</u>	<u>56.2</u>
Total NSF	197.3	204.8	243.3

*Figures not available

DEPARTMENT OF ENERGY (DOE)

Funding for mechanical engineering research in DOE for four programs is presented in Table 2. Due to restructuring of some of the budget

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categories by DOE, funding values illustrated for FY 1999 may not be consistent with the values presented for FY 2000 and FY 2001.

Funding in Office of Science programs for Basic Energy Sciences (BES) would increase by 30 percent over FY 2000 in the budget proposal. Major budget initiatives for FY 2001 include: nanoscale research, robotics and intelligent machines, and life sciences research in bioengineering. Advanced scientific computing, human and microbial genome research, and research in climate change technology would continue and increase. Engineering research funding for programs such as nanoscale technologies and robotics is less than three percent of the overall BES budget. Construction of the \$1.4 billion Spallation Neutron Source at Oak Ridge National Laboratory (ORNL) for neutron scattering research would continue.

Overall, funding for programs in Energy Supply would increase by 13 percent in the industry, transportation, and building technology sectors. The Industries of the Future Program would continue at slightly higher levels. Major increases are proposed in the transportation technology program for improvements in vehicle mileage leading to an 80-mile-per-gallon family sedan. Major increases are also proposed for building technology programs to continue the development of energy efficient buildings and improving present building technologies.

Fossil Energy programs would receive 7 percent less than in FY 2000. Although \$19 million in reductions are recommended for the Coal and Power Systems programs, work on the Vision 21 power plant and distributed power systems programs would be continued at the expense of reducing the turbine programs. Distributed generation, carbon sequestration, and ultra clean transportation fuels would be given major emphasis. Increases of 23 percent are recommended for natural gas research, including gas-to-liquid programs. Petroleum programs would be reduced by \$5 million, or eight percent.

An increase of 20 percent is proposed for Energy Conservation programs. The Power Technologies sector would focus on two main programs: improving the performance of technologies which generate electricity from renewable energy resources in a restructured utility environment, and increasing the efficiency and reliability of the national

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electricity grid. The Nuclear Energy Research Initiative (NERI) would be increased by \$13 million, or 56 percent, to rebuild U.S. nuclear technology leadership. Additional emphasis would be placed on increasing the number of students in nuclear engineering.

DEPARTMENT OF TRANSPORTATION (DOT)

The overall FY 2001 request for DOT would increase funding 9.3 percent, to \$54.9 billion. R&D funding for all DOT agencies is shown in Table II-15. A number of interagency initiatives are strongly related to mechanical engineering research. Intelligent Transportation Systems has a proposed 83 percent increase, to \$338 million, and includes enhanced traffic control systems, electronic messaging, and the Nationwide Differential Global Positioning System (GPS). The Next Generation High Speed Rail Program is proposed to decrease 22 percent, to \$22 million. This program focuses on alleviating highway congestion along busy routes (*e.g.*, the Northeast corridor). A 79 percent increase, to \$286 million, is proposed for the research and operations portion of the National Highway Traffic Safety Administration (NHTSA) budget. Initiatives included are: Partnership for a New Generation of Vehicles (PNGV), \$3.5 million; the National Transportation Biomechanics Research Center, \$23 million; and the Advanced Vehicle Program (AVP), \$20 million. The AVP is designed to integrate advanced technologies and innovations in components, infrastructure, emission reduction, and fuel efficiency for use in medium- and heavy-weight vehicles. The FAA is proposing an 18 percent increase to \$284 million for its R&D budget, to be focused on aircraft structures and materials, explosive detection, and security initiatives.

ENVIRONMENTAL PROTECTION AGENCY (EPA)

The FY 2001 request for mechanical engineering-related R&D at EPA is \$144 million, a decline of 4.1 percent from FY 2000 levels. Most of EPA's R&D funding is in the Office of Research and Development (down 1.2 percent, to \$530 million).

A great deal of air flow and emissions modeling would be integrated from assessments of multiple stressors. Efforts would continue in development of pollution prevention design and assessment tools, along with innovative

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methods. Some specific tasks would include conducting SITE evaluations, RCRA Corrective Action Initiatives, Technology Transfer, Combustion Technology Assistance, and Peer Reviews.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)

The total NASA budget request is \$14.0 billion, a 3.2 percent increase over FY 2000. Mechanical engineering-related research is conducted primarily in the Research and Technology Base portion of NASA's Science, Aeronautics and Technology account, and includes vehicle systems, propulsion and power, flight research, rotocraft, space transfer and launch technology, and information technology. The Research and Technology Base element is proposed to decline by \$43.0 million, or 7.4 percent. A decline is also proposed for commercial technology programs. A sharp increase is proposed for Focused Programs (up \$100.0 million or 24 percent), primarily for Pathfinder technology demonstrations and second-generation Reusable Launch Vehicles (RLVs).

Research in Space Science is proposed to increase 9.4 percent, to \$2.4 billion, and Life and Microgravity Sciences research would increase 10 percent, to \$302 million. Earth Science research would decline 2.6 percent, or \$37.0 million. Mechanical engineering activities constitute a minor portion of research in these three areas.

NATIONAL INSTITUTES OF HEALTH (NIH)

The total FY 2001 NIH budget request is \$18.8 billion, which represents a \$1.0 billion, or 5.6 percent, increase over FY 2000.

In FY 2000, Bioengineering Research Support is estimated at \$662 million, or 6.8 percent, of total NIH Research Project Grants (RPGs). The focus of bioengineering at NIH is the Bioengineering Consortium (BECON), which consists of intramural and extramural senior-level representatives from each of the NIH institutes, centers, and divisions plus representatives of other federal agencies concerned with biomedical research and development. One of these Institutes, the National Institute of Dental and Craniofacial Research (NIDCR), will continue its support for biomimetic and tissue engineering activities during FY 2001. The total FY 2001 budget request for NIDCR is \$263 million, an increase of \$14

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million (5.7 percent) over FY 2000. In FY 2000, NIDCR support for bioengineering, including biomaterials, biomimetics/tissue engineering, and nanotechnology, is estimated at \$55 million (41.3 percent of its estimated total RPG support). Nanotechnology and nanoscience research related to biomedicine have been identified by NIH as areas of special emphasis for FY 2001. For more information on the NIH budget, please see Chapter 10.

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

The portion of the NIST budget related to mechanical engineering consists of two distinct components: Industrial Technology Services (ITS), \$340 million; and Scientific and Technical Research Services (STRS), \$332 million.

Most of the proposed budget increase for FY 2001 is in the ITS component, which has two major elements: the Advanced Technology Program (ATP) and the Manufacturing Extension Partnership (MEP). ATP's budget would increase by \$33 million (23 percent) above FY 2000 to promote industry's ability to undertake technologically challenging efforts that have potentially broad economic benefits. The request, when combined with anticipated carryover and prior year recoveries, would permit approximately \$176 million for new awards in FY 2001.

The MEP request for FY 2001 of \$114 million, an increase of \$10 million (9.5 percent over FY 2000 levels), would permit NIST to continue providing the federal share of funding to the network of centers serving smaller manufacturers in all 50 states, the District of Columbia, and Puerto Rico. The number and operating level of the centers is not expected to change in FY 2001. The MEP request includes a \$6 million reduction in MEP base funding, reflecting a redirection of funds into new program areas supporting e-commerce outreach to small and medium-sized manufacturers.

A new initiative (\$50 million) within ITS is the Institute for Information Infrastructure Protection (I³P) which is responsible for federally mandated computer security. The I³P would support research and technology development to protect critical information and telecommunications infrastructures from attack or failures.

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The STRS budget is proposed to increase 20 percent to \$332 million. The additional funds would further the development of critical measurement technologies, methods, and services needed by the United States to promote technological progress, and enhance international competitiveness through the promotion of standards.

NATIONAL SCIENCE FOUNDATION (NSF)

The total FY 2001 NSF budget request is \$4.6 billion, representing a \$675 million, or 17.3 percent, increase over FY 2000 spending estimates. Research and Related Activities comprise the dominant part of the total NSF request, at slightly over \$3.5 billion, a 19.7 percent increase. The FY 2001 request for the Major Research Equipment portion is \$140 million, up 48.2 percent over the FY 2000 level (see Table II-7 and Chapter 9 for more on NSF).

The Computer and Information Science and Engineering (CISE) Directorate has the largest budget request increase, up \$140 million to \$530 million. This reflects NSF's ongoing leadership of the Information Technology for the 21st Century (IT²) initiative. The IT² initiative increases are distributed equitably across NSF initiatives and core programs. Funding requests for NSF's three remaining initiatives—Nanoscale Science and Engineering, Biocomplexity in the Environment, and 21st Century Workforce—include \$69 million, \$66 million, and \$40 million increases, respectively. The remaining \$320 million of the proposed total increase would support the remaining activities at NSF, most notably the core programs.

The FY 2001 budget request for the Engineering Directorate (ENG) is \$460 million, an increase of 19.6 percent over FY 2000. This increase is slightly ahead of the overall NSF increase. Funding for mechanical engineering-related research within Engineering would rise 18.8 percent, to \$243 million. Details of the mechanical engineering component of the NSF budget appear in Table 2. Given the multidisciplinary nature of modern engineering research, funding for mechanical engineering-related research may be obtained from programs outside of the selected group and outside of Engineering overall.