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United States and Technological Preeminence

When the Soviet Union successfully launched the first Sputnik in 1957, the U.S. response was immediate and effective. Today, U.S. technological leadership is again being challenged. In the past several decades Japan has gained world leadership in the production of steel, the manufacture of automobiles, and the development of many electronic devices. The failure of the United States to respond effectively to this challenge has serious long-term implications for its economic position and defense capability.

From a worldwide perspective, U.S. scientific research is generally in the forefront. However, the rate of technological progress in the United States has fallen behind that of foreign competitors. The restoration of U.S. technological preeminence is dependent on several factors. Of primary importance are research in engineering and the education of the engineering work force. Also essential are effective working relationships among the three major entities involved with technology: industrial companies, colleges of engineering, and federal agencies.

In the United States, engineering research is no one's specific responsibility. The federal government views it as primarily an industrial responsibility, although most industrial companies limit their research to relatively short-term objectives. The technical areas in which engineering schools carry on research are largely determined by the federal funding agencies. Technical areas coincident with the missions of major federal agencies are adequately funded, while other technical areas are relatively neglected. An important example of such an underfunded area is the field of robotics and factory automation.

In the past 10 years the approximately 280 U.S. engineering colleges have been stressed by a 100 percent increase in undergraduate enrollments and a decrease in U.S. graduate students. Although the baccalaureate degrees granted have increased by more than one-third in this period, the industrial demand for engineering baccalaureates has not been met. In electronic and computer engineering, a recent survey* indicated that the supply is less than half the demand for the current year and will be less than one-third the demand in 1985. A direct result of attractive industrial job offers has been a decrease in the number of candidates available for faculty appointments. The best current estimates are that more than 10 percent of the available faculty positions in engineering and computing are vacant. Thus, despite the availability of highly qualified applicants, most leading engineering schools are not continuing to increase their enrollments. The other major limitation is the obsolete status of much of the laboratory equipment available for instruction. The increased complexity of modern instrumentation plus the inflation in equipment costs have overextended college budgets available for equipment and facilities. Quality engineering education requires modern facilities.

The final factor is the lack of effective working relationships among the entities on which U.S. technological advance is most dependent. The relations between industrial companies and colleges of engineering are not as strong as those in West Germany. The relations between industry and government agencies are not as effective as those in Japan.

These barriers to increasing the rate of U.S. technological advance are not insurmountable. The first step is to recognize the serious nature of the challenge. Then the nation's scientific and technological resources should be mobilized, as they were after the first Sputnik.—F. KARL WILLENBROCK, Cecil H. Green Professor of Engineering, Southern Methodist University, Dallas, Texas 75275

*Technical Employment Projections, 1981–1983–1985 (American Electronics Association, Palo Alto, California, 1981).