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STATEMENT OF
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BEFORE THE

SUBCOMMITTEE ON LABOR STANDARDS

COMMITTEE ON EDUCATION AND LABOR

HOUSE OF REPRESENTATIVES

ON

"AUTOMATION IN THE WORKPLACE: BARRIERS,
IMPACT ON THE WORKFORCE,
AND THE FEDERAL ROLE"

Mr. Chairman and members of the Subcommittee, thank you for the opportunity to appear before you and discuss automation in the workplace. In your May 6, 1982, letter and in meetings with your staff, it is clear that the Subcommittee is concerned about the Federal role in fostering automation as a way of improving national productivity and the impact of that automation on the work force. My statement, based on GAO's past and ongoing work in the area, addresses these concerns.

Automation is defined as the use of microelectronic and other technologies that either reduce the need for people, enable people to perform more work, or perform functions that people cannot. Automation is important to the Nation's economic well-being by

improving productivity and product quality in the office and in the factory. Automation can be an important factor in productivity improvement. At the same time, rapid, widescale adoption of automation exacerbates such problems as labor displacement, skill shortages, geographic dislocations, time lags in education and technical training, and labor/management bargaining.

While the private sector properly must assume primary responsibility for developing and implementing automation technology, the Federal Government has had and will continue to play some role. We believe the Federal Government should develop policies and programs to encourage continued growth in automation and address employment problems that automation may create. Although we are not prepared to offer specific recommendations at this time, we do see the need for a more organized and systematic Federal approach to automation.

In my statement today, I will discuss

--the importance of automation to productivity and the economy,

--the barriers to and stimulators of the rapid adoption of automation,

--potential adverse effects on the work force,

--current and potential Government roles, and

--the need for an overall plan to guide Federal policies and programs to both stimulate growth relating to automation as well as its impact on the work force.

Importance of automation to productivity and the economy

A key factor in productivity and economic competitiveness is automation. Our lag in implementing automation in comparison with other industrial nations is in part reflected in our declining productivity.

Declining national productivity is a matter of increasing concern. In 3 of last 5 years, labor productivity has declined. In 1981, it showed a modest increase of 0.9 percent, but the 1.0 percent decline in the first quarter of 1982 offsets any grounds for optimism. The problem is both serious and long term.

Growth in the capital/labor ratio, which has been a key source of labor productivity, is increasingly an important barometer of investments in automation. The capital stock grew at relatively high rates in this country over the 1947-73 period, compared its growth since then. The Japanese, who are making extensive use of automated manufacturing technology, have maintained a high relative capital/labor ratio, resulting in greater output per worker. For example, between 1973 and 1980, American output per hour rose 1.7 percent per year, compared to 6.8 percent by the Japanese. If this disparity continues, the U. S. economy stands to lose ground in two important markets: automated systems and equipment, totaling billions of dollars annually, and the consumer goods market, totaling hundreds of billions of dollars annually.

Even more ominous is the prospect that further losses of the producer goods market could signal an over reliance on foreign

producers for the automation systems and components that sustain our industrial base in general and our defense industrial base in particular. Foreign machine tool manufacturers, for example, have doubled their share of the American market in the last 7 years. The Japanese expect worldwide sales of their robots to increase from $392 million in 1979 to as much as $5 billion by 1990. These issues are creating a sense of urgency on the part of American industry, labor, and Government to push automation at a revolutionary rate.

Barriers and stimulators to rapid automation

Numerous barriers impede the rate of adoption of this automation technology, but stimulators also exist which motivate both producers and users of the technology. Thus, the question today is not whether, but rather how rapidly automation will expand. As evidenced by a growing number of companies that are entering or expanding their product lines in the producer goods industry--such as robots, office systems, and others, rapid growth is clearly anticipated. Whether the growth is as fast as it could be depends on how effective we are in overcoming the barriers to growth.

The barriers to more rapid implementation of automated technologies in the United States can be categorized as technical, financial, and social.

Technical barriers are encountered in getting automated equipment to work. These can include

--a lack of technical expertise to design, debug, and implement automated technologies;

--problems and costs in developing the software to make the

systems work;

--an absence of the necessary standardization;

--a shortage of qualified persons to operate and service automated equipment and systems; and

--technology transfer inefficiencies and problems.

People who can develop the software needed to make automation work are scarce and much in demand. Also in demand are production and manufacturing engineers who can design a plant to accommodate automated equipment in the most productive manner possible. For example, optimum results of automated systems often come about by completely redesigning the traditional manufacturing processes. Unless this is fully understood by American managers, costly mistakes can be anticipated by incorporating bits and pieces of automation into their outdated layouts. Shortages of the kind of expertise needed for systems design work is likely to continue for several years, until university curricula are established to offset the shortages.

Financial barriers arise from the necessity to invest in new capital equipment such as automated devices. Some of these barriers are

--the current high interest rates;

--the tendency of business to focus on short-run needs;

--other capital investment considerations such as cash flow, cost recovery, and the risk involved in investing in new, untried equipment; and

--the uncertainty of the marketplace.

The investment objective of many companies is to recoup the

cost of equipment in less than 3 years--much too short to properly assess long term benefits of automation. The cash flow position of a company is also crucial in its decision whether to invest in new equipment.

Finally, there are social barriers based on human resistance to change. For example, a union may be apprehensive about the impact that automation can have on its members and may resist it, for a time, by attempting to protect its membership through restrictive labor-management contract clauses. Even managers themselves are apprehensive about using new equipment or handling other changes that might follow. Initial consumer resistance to automatic checkouts at supermarkets and to electronic funds transfers are good examples of human mistrust of automation.

Despite these barriers to automation, the national economic problems now being faced--rising labor costs, decreasing competitiveness, shrinking market shares--stimulate both development and use of automation technology. Potential users are seeking ways to reduce costs and increase market share and profits. Automation technology is seen as a possible solution.

Simultaneously, the market potential for automation technology is motivating producers to create new and better products, systems, and support services. Automation packages--hardware and software--are becoming more comprehensive and perform more functions. Competition, including that from foreign technology vendors, is resulting in packages that are more affordable. For example, ready for use computer-aided design systems, complete with software programs, are currently available for under $100,000,

making them affordable to a much broader segment of the manufacturing sector.

As automation technologies mature and competition among vendors increases, market forces and human ingenuity are likely to cause a proliferation of more and better systems--affordable and useful to a wider segment of the economy. Available evidence suggests this is already taking place. For example, sales projections for components of the automation field range from 30 to 50 percent compounded annual growth. Sales growth during the last 2 years adds validity to these projections.

Thus, while it appears that some of the barriers described earlier are being overcome and that the Nation is beginning an exponential growth curve in automation technology development, adoption, and use, other barriers may persist for several years. Understanding the implications of automation growth and barriers in relation to Federal policies and programs will require close attention and analysis.

Potential adverse effects on the work force

The potential for job displacement is the other side of the coin that must be considered when discussing advancing automation in the United States. The term displacement means different things to different people. We define it as persons laid off or unable to find jobs because of automation.

We recently issued a staff study entitled "Advances in Automation Prompt Concern Over Increased U.S. Unemployment." This study discusses the views of many persons involved in this area about both short-run and long-run unemployment, and explains

why people disagree about what is going to happen in the future.

The concern over whether automation will cause high rates of unemployment is not new. In 1964 the Congress established the National Commission on Technology, Automation, and Economic Progress. One of the main reasons the Commission was established was the concern over the possible employment impact of the use of computers. The Commission concluded in 1966 that automation would not cause severe unemployment over the next 10 years and, in fact, it did not.

We are now seeing renewed concern about automation's effect on employment because of its expanding uses in virtually all sectors of the U.S. economy, uses made possible by the advent of microelectronics. Microelectronic computers are smaller, less costly, and more easily used. Microelectronics has made automation usable in many more applications and is the main force behind the increased use of automation in the manufacturing and service sectors.

Job displacement can be long-run or short-run. Long-run displacement means an overall, relatively permanent increase in unemployment levels. Short-run displacement refers to a temporary loss of jobs until new jobs are created and filled by retraining workers initially displaced. Short-run displacement is occurring now and will continue, at least for some time. Almost all the experts agree on this. Two examples of short-run displacement are

--the use of automated typesetting equipment which has

led to the lay-off of many highly skilled and well-paid typesetters and

--the increasing use of robotics and other automated equipment in automobile manufacturing.

Recently published predictions have cited the potential loss of millions of jobs in the manufacturing sector because of the use of robotics. Short-run displacement is also occurring in or expected to affect many other occupations, including telephone operators, postal workers, textile and railroad employees, inspectors, middle managers, office workers, and warehouse drivers. At the same time, new and existing occupations are expected to increase because of the advent and diffusion of automation. The increased demand for persons to fill these additional jobs is a direct result of automation and include many jobs, including those in engineering and computer science. In addition, in the short-run, many people, although keeping their jobs, are being asked to perform new functions requiring new skills. As we noted in our staff study, many kinds of occupations will be affected, both high- and low-skilled.

We found little agreement on the long-term displacement effects of automation, and for good reasons. Some experts believe that unemployment levels will not increase because automation will (1) assist U.S. industries in fighting foreign competition, (2) create new jobs that will equal or exceed those jobs eliminated, and (3) foster economic growth which, in itself, will create more jobs. The Department of Labor assumes a 4 to 6 percent unemployment rate for 1990 and projects an increase in overall jobs of up to 31 percent as compared to 1978.

Others believe long-run unemployment levels will not reach these targets because automation will create structural changes in the work force. This view presumes that (1) the increased capacity to produce goods and services through automation will be more than the increase in demand for them, (2) the economy increasingly will be unable to absorb displaced workers because all sectors will be affected simultaneously, (3) the shift in skill requirements caused by automation can result in a mismatch between the skills required in the new jobs created and the backgrounds and capabilities of persons unemployed and available for work.

Three basic unknowns account for disagreement of the long-run unemployment issue:

--the rate of diffusion of the technology,

--other forces that affect unemployment levels, and

--the lack of comprehensive data today about the overall net effect of automation.

The rate of diffusion depends on how rapidly the barriers to implementation are overcome. Other forces that affect unemployment include foreign competition, consumer preferences, and population and personal income growth, among others. Absence of specific and comprehensive information about automation's net impact on jobs in this country makes accurate predictions impossible. The Department of Labor does not have the information, nor does anyone in the private sector.

Automation will continue to have an effect on the work force. It will require workers to acquire new skills and will result

in short-term displacement. Whether automation will result in long-term unemployment is simply unknown.

Current and potential Federal roles for encouraging and responding to private sector adoption of automation

The Federal Government's involvement in the automation of private industry falls into two major categories: efforts to encourage and facilitate automation and responsibilities to protect the work force from potential negative consequences of rapid automation. The extent to which the Government fulfills these rolls is often overshadowed by unresolved questions.

Federal efforts to encourage automation fall into at least five types of involvement: Financial incentives for private sector action, Federal research responsibilities, technology transfer mechanisms, Federal efforts to support engineering education, the development of standards to facilitate integration of diverse components of automation systems. I will briefly discuss each of these areas and point out some of the controversy surrounding Federal involvement in each.

Federal financial incentives are aimed primarily at stimulating research, development, and capital investment. Two relatively new Federal actions are the Economic Recovery Act of 1981 and DOD's capital investment incentives. The Economic Recovery Act provides for more rapid depreciation of new investments in plant and equipment and increases the size of investment tax credits. DOD's capital investment initiatives encourage modernization of the defense industrial base by:

--Increasing program stability and use of multiyear

procurement.

--Supporting legislative efforts to revise tax and profit policies.

--Improving contract incentives.

--Increasing direct investment in technology for the private sector.

Neither of these actions were taken specifically to foster automation and improve productivity. However, because they may accelerate private sector adoption of automation technologies, both play an important role in encouraging automation. The effects of these actions on private sector capital investment and automation have not been determined.

The second area of Federal involvement is support of automation related R&D both within and outside the Federal Government. Agencies involved in automation-related R&D include NASA, DOD, Commerce, and the National Science Foundation, among others. For example:

--NASA's Integrated Programs for Aerospace Vehicle Design, which showed that dramatic increases in engineering productivity were feasible by automating routine information handling tasks.

--Air Force's Integrated Computer Automated Manufacturing program, which is encouraging and demonstrating research for an aerospace "factory of the future."

--Commerce's effort to establish an inhouse automated

manufacturing research facility, which should facilitate development of industrywide standards.

While other programs could be described, most are mission oriented and are affected by disagreement over the extent to which Government should set priorities and support research in automation. For example, at the same time the Air Force is increasing its funding of research in integrating systems, NASA is reducing its software development program which the Air Force planned to use. In the words of one NASA official, "what is missing is a comprehensive, integrated strategy to address the technology. No one is looking beyond individual needs to develop a strategy to improve automation systems."

Another area of involvement encompasses Federal efforts to transfer the technology results of R&D programs. The Congress has shown its support for technology transfer by enacting laws to require it, such as the Technology Innovation Act of 1980, often referred to as the Stevenson-Wydler Act. However, overall Federal support for technology transfer has been inconsistent. On the one hand, the Department of Defense is increasing funding for its "active" technology transfer program, which "pushes" the technology into industry. On the other hand, most civil agency transfer programs have been reduced or reshaped to emphasize "passive" transfer, which requires industry to "pull" the technology to it. This situation is an outgrowth of the different philosophies that have evolved in Federal agencies on technology transfer.

In addition, Government transfer programs tend to serve

agency missions and therefore are not systematically coordinated. This results from the absence of a deliberate Federal effort to move the technology from point to point in its development and commercialization or to coordinate transfer programs.

Another area is the Federal Government's support of engineering education and facilities. There is currently a serious shortage of engineers trained to implement automation. Increased enrollment at engineering schools in this country indicates that the problem will correct itself, provided the schools are able to admit and adequately train students. But many believe that without assistance, universities will be unable to retain the faculty, purchase the equipment, and develop the new curricula necesary to handle the student increases. While Federal programs supporting engineering education exist in several agencies, comparatively little Federal funding is directed toward improving the state of engineering schools. Rather, most support provides financial aid to increase the supply of engineers.

Finally, if the Federal Government wishes to accelerate the adoption of advanced automation in industry, the National Bureau of Standards can help overcome a major barrier--the lack of standards for integrating components of the technology. Industry standards provide users with flexibility in building automated systems and increase user confidence in quality, which in turn, foster automation's adoption. However, the development of standards for advanced automation technology has been slow. Government has not unilaterally set these standards but has worked with industry to voluntarily build a consensus on the

standards that industry should adopt.

The other major category of the Government's involvement in the automation of private industry is the potential impact of automation on the work force. This area is characterized by controversy over the appropriate roles in addressing labor displacement, skills training and retraining, and potential friction between labor and management.

Current Federal programs are not aimed specifically at resolving these issues. The unemployment compensation insurance program, for example, is aimed at general unemployment and was not intended to provide for training and retraining. The Comprehensive Employment Training Act (CETA) is aimed primarily at the chronically unemployed and disadvantaged and, while it has the potential for addressing training in technical skills needed in an automated environment, the programs have not emphasized this area of training. Trade adjustment assistance was aimed at displacements resulting from increased imports and includes training and retraining of workers displaced due to imports. Training of workers displaced by automation, however, is not included as part of trade adjustment assistance.

The Department of Labor has acted as a catalyst in facilitating communication between labor and management but only intermittently and on an industry-by-industry basis. For example, to foster cooperation the Department has sponsored tripartite committees for the construction, steel, and air-

line industries. These committees, however, were not established or utilized to address automation issues.

Information on displacement, job movement, and skills shifts is vital. So far, however, the Department of Labor has made limited progress in analyzing the potential impact of automation. Labor analysts are projecting continued growth for certain occupations being affected by automation, although they believe automation may slow that growth somewhat.

Federal support for education and vocational training has declined, leaving unanswered questions as to which sectors of the economy should be responsible for the training and retraining of new technical skills, as well as for education programs in engineering, computer science, and other disciplines for which industry officials say a bottleneck to automation already exists.

The need for an overall plan to guide Federal policies and programs relating to automation

Federal policies that affect productivity are often criticized as being ad hoc and not coordinated. This criticism is predicatable, given the myriad issues involved, the fact that all of them are interrelated, but that the rules and policymaking responsibilities to address them are dispersed among numerous congressional committees and subcommittees, as well as various Federal agencies. Within this context, maintaining a proper balance in National policies is extremely difficult.

The issues surrounding automation technology, for example, demonstrate the interrelatedness of polices, rules and Federal programs. We believe these issues demonstrate the need for a

planned strategy or framework within which the dispersed rules and policmaking responsibilities can be carried out in a more structured or systematic way.

Automation, for example, demonstrates the need to balance policies to both overcome technological barriers and address social and employment issues. To gain the balance needed, many questions are involved. On the technology side:

--Will existing tax incentives foster automation and stimulate productivity at all levels of the economy?

--Will capital investment incentives, such as DOD's manufacturing technology program, accelerate private sector adoption of advanced manufacturing technology?

--Are there areas of research needed to support accelerated automation which the private sector cannot be expected to?

--And if so, will Government-sponsored technology be used by the private sector?

--Can universities provide the engineering and other disciplines necessary for growth in automation?

--Is standardization of automation technology proceeding at an acceptable pace?

On the employment side can we:

--Balance the demand for new skills with those displaced by automation?

--Obtain and dissiminate current and accurate information about occupations being affected or likely to be affected by automation?

--Facilitate labor-management cooperation for smooth transition to further automation?

--Overcome such human barriers to shifting careers as age, mobility, and financial considerations?

--Prepare for the possibility of long-term, permanent unemployment?

These and many other questions need to be addressed in examining existing and future policies and programs relating to automation.

What is vital, we believe, is an overall plan and strategy in the Federal Government that, as a minimum, would assure (1) coordination of Federal policies and programs, (2) a means of evaluating their impact, (3) the collection, analysis, and dissemination of comprehensive and specific information about automation and jobs, (4) a mechanism for continuing dialogue among affected sectors, and (5) the assignment of responsibility to see that necessary actions are carried out.

We are aware of numerous legislative proposals to address training, retraining, relocation of workers, and various technological and financial barriers to automation. Because most of the issues involved in automation are interrelated, the Congress will need to explore with industry, labor, academia, and executive departments and agencies ways to develop a national approach to automation.

In previous reports and in congressional testimony, GAO has expressed the need for a Federal focal point to guide and coordinate Federal programs aimed at improving national productivity

and to work closely with the private sector to develop a productivity plan. Such a plan would recognize automation as an important variable in national productivity growth. Our work in automation further reinforces the need for a productivity plan that would

--identify and describe the relationship and effect of Federal policies and programs on private sector productivity;

--delineate clearly the responsibilities of Federal department and agencies having program responsibilities within the plan;

--identify unnecessary obstacles to productivity improvement created by the Federal Government;

--develop alternative policies, programs, activities, and lines of responsibility to improve private sector productivity; and

--list short- and long-range objectives and their priorities and recommend specific projects and programs within those objectives and priorities.

We believe the issues surrounding automation technoligy demonstrate the complexities of balancing national policies and priorities. Yet, technology, as complex as it is, is only one part of the total productivity picture of the Nation. For these reasons, we believe it is essential to develop an overall plan or framework within which relevant policies, rules and programs are considered.

This concludes my statement, Mr. Chairman. I will be happy to respond to your questions.