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Report to Congressional Requesters

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METRIC CONVERSION

Future Progress Depends Upon Private Sector and Public Support



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The Honorable Ernest F. Hollings
Chairman, Committee on Commerce,
Science and Transportation
United States Senate

The Honorable George E. Brown, Jr.
Chairman, Committee on Science,
Space, and Technology
House of Representatives

In response to the Metric Conversion Act of 1975, as amended, and subsequent discussions with your offices, this report provides a review of federal metric conversion activities. It contains recommendations to the Secretary of Commerce and the Chair, Interagency Committee on Metric Policy.

As arranged with your offices, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of this letter. At that time, we will send copies to the Secretary of Commerce and the heads of other key departments and agencies involved in the federal metric transition. Copies will be made available to others upon request.

This report was prepared under the direction of Victor S. Rezendes, Director, Energy and Science Issues, who can be contacted at (202) 512-3841. Major contributors to this report are listed in appendix V.

A handwritten signature in cursive script, appearing to read 'J. Dexter Peach'.

J. Dexter Peach
Assistant Comptroller General

Executive Summary

Purpose

The United States remains the only major industrialized nation with a nonmetric measurement system and may therefore be disadvantaged in global markets. Consequently, conversion to the metric system, known as metrication, is viewed as an important issue facing the United States. In August 1988, as part of the Omnibus Trade and Competitiveness Act, the Congress required federal agencies to use the metric system, to the extent economically feasible, by the end of fiscal year 1992 in their procurements, grants, and other business-related activities. The Congress also directed GAO to review the implementation of the act at the end of fiscal year 1992 and to report its findings along with any recommendations. In conducting this review, GAO evaluated agency activities in (1) establishing metric guidelines and preparing reports on the transition, (2) using the metric system in procurements, (3) using the metric system in grants and other business activities, and (4) dealing with private sector and public attitudes toward conversion.

Background

Executive Order 12770 of July 25, 1991, reaffirmed the federal commitment to metric conversion and designated the Department of Commerce to direct and coordinate the federal conversion effort. The executive order authorized the Secretary of Commerce to establish and chair the Interagency Committee on Metric Policy (ICMP) and the Metrication Operating Committee (MOC), which guide and coordinate the conversion effort. The interagency MOC oversees a series of subcommittees, each dealing with a specialized area, such as procurement or public education and awareness.

In a preliminary 1990 review of metrication,¹ GAO found that agencies had not demonstrated a commitment to conversion or advanced beyond the early planning stages. GAO also found that the private sector's lack of support for the metric conversion would limit progress.

Results in Brief

Since 1990, federal preparations for metric conversion have advanced dramatically. More than 30 agencies have developed some combination of guidelines, transition plans, and progress reports that indicate a substantially greater commitment to metrication. A few agencies, such as the Department of Education, however, have taken very limited action since GAO issued its 1990 report.

¹Metric Conversion: Plans, Progress, and Problems in the Federal Government (GAO/RCED-90-131, Mar. 30, 1990).

Although most agencies have made extensive preparations for metric conversion, they are still facing serious difficulties in putting their plans into practice. These difficulties include, among other things, a procurement environment in which most products are nonmetric and in which federal agencies represent too small a share of the total market to stimulate private sector conversion. These difficulties have led the Department of Defense (DOD) and the National Aeronautics and Space Administration (NASA) to request complete waivers from metrication requirements in cases involving, for example, entire ships or satellites. Both agencies, however, have also explored an approach that encourages metrication of "subsystems," such as ship hulls or satellite frames, as an alternative to waiving the metric requirements for the entire system.

Mixed progress has been made toward metric conversion in the areas of federal grants and other business activities. Grants for research require the use of the metric system, but such a commitment has not been made for grants in other areas, such as housing and education. Agencies that undertake other business-related activities, such as federal programs involving farmers or highway signs, are concerned about private sector and public resistance to conversion. (As used in the report, "the private sector" refers to industry and "the public" refers to consumers.)

The federal government by itself cannot achieve the goal of metric conversion. It must depend upon support from its private sector suppliers and from the public if the conversion is to be successful. Now that most agencies have made significant progress in preparing for metric conversion, a broader national dialogue between the government, the private sector, and the public is needed to discuss the next steps in decision-making about metric conversion.

Principal Findings

Federal Preparations for Metric Conversion Are Well Under Way

In sharp contrast to the limited progress that GAO reported in 1990 when only a few agencies had developed guidelines and only one agency had prepared a transition plan for metric conversion, dramatic advances in federal preparations for conversion have taken place since. Most federal agencies have now issued guidelines for their conversion activities. In addition, more than 30 agencies have developed transition plans, and most of these agencies have provided progress reports to either the Congress or

the Secretary of Commerce or to both. In many cases, the reports indicate not only that headquarters officials are involved in the process but also that preparations are occurring throughout federal departments and agencies. However, the Department of Education, which has a key role to play as chair of the interagency Subcommittee on Education and Public Awareness, has not finalized its guidelines and has taken limited steps to define how it will carry out its responsibilities.

Basic Problems Limit Federal Metric Procurement

In spite of their generally impressive preparations for metric conversion, agencies are having problems carrying out their plans, especially in the area of procurement. Three major federal procurement agencies, the General Services Administration, DOD, and NASA, cited the nation's nonmetric environment as a key barrier. Commercial products procured by all agencies as well as specialized products procured by DOD and NASA are generally not based on the metric system. Federal procurement exerts little influence in overcoming private sector resistance and changing this environment; it accounts for only a tiny fraction of the total market and offers private suppliers no incentive for conversion.

At DOD and NASA, requests for waivers from metric requirements indicate further procurement difficulties. Both agencies have had such requests approved for several of their new acquisitions. However, both agencies have also begun exploring a subsystem approach to identify portions of a system that can be converted rather than waiving the requirements for the entire system.

One outstanding exception to these procurement problems involves construction. All federal construction, a \$40 billion annual expenditure, is scheduled for conversion by January 1994; as of July 1993, federal construction projects totaling about \$12 billion were being converted. One reason for this success is that about 95 percent of the products used in the construction of buildings will not change in size; only the numbers describing these products will be switched to the metric system.

In general, however, federal procurement of metric products remains limited, and federal efforts to address procurement issues face many unresolved problems. These problems include (1) difficulties in implementing the definition of basic terms, such as "metric product" and "metric preference," and (2) the potentially costly premiums that may be associated with the use of metric products. In view of the nation's nonmetric environment, the conversion effort may also be hampered by

other federal goals, such as the "Buy Commercial" provision in federal procurement regulations. This provision requires agencies to rely on "off-the-shelf" products purchased from the private sector that are generally nonmetric. In addition, there is disagreement about the role of procurement policy officials in the government's conversion effort. Metric officials believe that procurement experts are needed to provide guidance in support of the conversion effort, but DOD procurement officials have disengaged themselves from the conversion process because they believe metrication is a technical rather than a procurement issue. In a July 1993 response to the procurement problems, the ICMP approved acquisition guidelines listing seven actions that agencies may take to implement metric usage.

Grants and Other Business Activities Show Mixed Progress

The federal grant process and other business activities show mixed progress toward metrication. Grants for research require use of the metric system, and metrication may be required for other grants activities in the future. For example, the Department of Transportation has stated that, beginning in late 1995, its \$18 billion Federal Aid Highway Program will require its grantees to use the metric system in road design. In other areas, such as housing and education, agencies have not yet decided whether metric requirements for grants will be developed.

Other business-related activities have made progress toward conversion in several areas, such as the use of metric units in publications, but many problems are also evident. These problems are frequently due to private or public opposition that curtails federal conversion efforts. The Secretary of Agriculture, for example, waived metric requirements for programs that directly involve farmers. The Federal Highway Administration is also facing concerns about the potential cost of converting highway signs. In a survey, the Department of the Interior found that 72 of 74 oil and gas companies and trade associations it deals with are opposed to conversion. The National Weather Service, a long-standing "metric" agency, converts its metric data into nonmetric units because of network concerns about public resistance.

Federal Agencies See a Need for Greater Support From the Private Sector and the Public

Federal agencies see a need for the private sector and the public to increase their support for metrication. NASA stated that federal conversion is a partnership endeavor and cannot be completed without industry support. An October 1992 Commerce report to the President states that some agencies question whether reliance on federal procurements, grants,

and other business-related activities will ever be fully effective in achieving conversion. Among other things, the report calls for exploring additional measures involving other sectors of the nation.

Although GAO regards initiatives such as the approval of interagency procurement guidelines as a good first step, GAO believes that further progress toward metric conversion depends upon greater cooperation with the public and private sector. The Metric Conversion Act, as amended, as well as the executive order provide the authority for initiating cooperative efforts. For example, the executive order specifically authorizes the Secretary of Commerce to form, as necessary, advisory committees representing other interests, including state and local governments and the business community, to achieve the maximum benefits of the order. Federal metric officials agree that they need to seek greater involvement by the private sector and the public, but they have not yet prepared a detailed plan for doing so.

Recommendations

Now that most agencies have made significant progress in preparing for metric conversion and the ICMP has developed interagency procurement guidelines, GAO recommends that the Secretary of Commerce explore ways for bringing together the government, the private sector, and the public to discuss the next steps in decision-making about metric conversion. To assist in this effort, the Secretary should prepare and implement a detailed plan for encouraging this broader national dialogue. One important aspect of the plan would be to encourage a higher visibility for metric usage by the government, private sector, and consumers.

As a useful compromise between the two extremes of total metric conversion or total exemption from metric requirements, GAO recommends that the Interagency Committee on Metric Policy support a subsystem approach in metric procurements when a total conversion is unfeasible. Under this approach, agencies would be encouraged to identify parts of a system that can be converted rather than waive the metric requirements for the entire system.

Agency Comments

A draft of this report was sent to the Department of Commerce, the General Services Administration, and the Departments of Education and Defense. Commerce stated that the report lacks a substantive review of the causes and remedies for the problems it uncovers. GAO believes that the report discusses these problems in detail. In particular, the report

focuses on the major problem of limited federal influence in altering what is essentially a nonmetric procurement environment in the United States. The report clearly points out that greater support from the private sector and the public is essential if further metric progress is to be achieved.

Commerce's remarks on our recommendations were inconsistent. For example, Commerce stated that the report fails to connect the problems it uncovers with specific recommendations. Yet Commerce disagreed with GAO's recommendation to develop a metric conversion plan to bring together the government, the private sector, and the public. Commerce stated that the law already provides a plan and that the important next step is its implementation. In GAO's view, the Metric Conversion Act, as amended, and the executive order provide the authority to seek greater involvement by the private sector and the public but do not provide a detailed plan to achieve this objective. Such a plan would provide a strategy for (1) involving key groups from the private sector and the public, (2) increasing the visibility of metric conversion, and (3) taking specific steps to achieve metric conversion.

The General Services Administration recommended that, before additional resources are consumed in preparing federal business activities for metric conversion, a complete reassessment of the viability of the statutory requirement be conducted. GAO does not believe that such a reassessment is appropriate at this time. Federal agencies have made progress in preparing for conversion. Their efforts now stand in need of greater support from the private sector and the public. The development and implementation of a detailed plan by Commerce remain necessary to bring together the government, the private sector, and the public if further progress is to be achieved.

Education discussed several factors, including its organizational statute and lack of resources, that have limited its progress in metric conversion. DOD stated that the GAO report is factual and reiterated its view that metrification is a technical rather than a procurement issue.

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Abbreviations

ASCS	Agricultural Stabilization and Conservation Service
C&GS	Coast and Geodetic Survey
CICA	Competition in Contracting Act
CRS	Congressional Research Service
DOD	Department of Defense
DOE	Department of Energy
HHS	Department of Health and Human Services
DOI	Department of the Interior
DOT	Department of Transportation
EPA	Environmental Protection Agency
FDA	Food and Drug Administration
FAR	Federal Acquisition Regulation
FHWA	Federal Highway Administration
FSS	Federal Supply Service
GPO	Government Printing Office
GSA	General Services Administration
HUD	Department of Housing and Urban Development
ICMP	Interagency Committee on Metric Policy
IRS	Internal Revenue Service
MOC	Metrication Operating Committee
NASA	National Aeronautics and Space Administration
NIST	National Institute of Standards and Technology
NOAA	National Oceanic and Atmospheric Administration
NRC	Nuclear Regulatory Commission
NWS	National Weather Service
OFPP	Office of Federal Procurement Policy
OMB	Office of Management and Budget
OSSA	Office of Space Science and Applications
PM	Program Manager
RDTE	Research, Development, Testing and Evaluation
SI	Le Systeme International d'Unites
SSC	Superconducting Supercollider
TRMM	Tropical Rainfall Mapping Mission
USDA	U.S. Department of Agriculture
USMA	U.S. Metric Association

Introduction

The Metric Conversion Act of 1975 (P.L. 94-168) declared a national policy to coordinate and plan the increasing use of the metric system and established a United States Metric Board to perform these functions. However, the act contained no statement of congressional preference for the metric system of measurement. In 1988, the Congress amended the original act and strengthened the federal commitment to metric conversion. For the first time in the nation's history, the Congress declared that it is the policy of the United States to designate the metric system of measurement as the preferred system of weights and measures for U.S. trade and commerce. The amendments, which make conversion mandatory for the federal government with certain exceptions such as impracticality, have led dozens of federal agencies to prepare for metric implementation. Further recognizing the importance of metric conversion, the President issued an Executive Order in 1991 that emphasized the need for leadership in this effort and defined federal responsibilities in greater detail.

Amendments to the Metric Conversion Act and Executive Order 12770

In August 1988, as part of the Omnibus Trade and Competitiveness Act, the Congress amended the Metric Conversion Act of 1975. The act, as amended, stated that world trade is increasingly geared toward the metric system of measurement and that industry in the United States is often at a competitive disadvantage in international markets because of its nonstandard measurement system. As a result, the act declared that it would be national policy to

- designate the metric system as the preferred system of weights and measures for United States trade and commerce;
- require that each federal agency, by a date certain and to the extent economically feasible by the end of the fiscal year 1992, use the metric system of measurement in its procurements, grants, and other business-related activities, except to the extent that such use is impractical or is likely to cause significant inefficiencies or loss of markets for U.S. firms;
- seek out ways to increase understanding of the metric system of measurement through educational information and guidance and in government publications; and
- permit the continued use of traditional systems of weights and measures in nonbusiness activities.

The amendments also required federal agencies to establish guidelines as soon as possible for carrying out these policies. In addition, they required

each agency, as part of its annual budget submission, to report to the Congress on its actions to implement the metric system, until such time as the agency has fully implemented its efforts.

To further strengthen the federal conversion effort, the President signed Executive Order 12770 in July 1991. It contains three sections directed at federal agencies. The first section deals with coordination by the Department of Commerce (Commerce). It designated Commerce as the "lead" agency and required the Secretary of Commerce to report annually to the President, beginning in October 1992, regarding metric progress. The second section deals with department and agency responsibilities throughout the executive branch. It requires departments and agencies to formulate and send two documents to the Secretary of Commerce — a metric transition plan (due by November 30, 1991) and an assessment of agency progress and problems together with recommendations for implementing metric conversion (due by June 30, 1992). The third section makes each department and agency responsible for applying the necessary resources to accomplish the goals set forth in the Metric Conversion Act and the executive order.

Commerce's Under Secretary for Technology chairs the Interagency Committee on Metric Policy (ICMP), which provides policy guidance on metrication for the heads of all federal agencies. The ICMP is composed of representatives from major federal departments and agencies who are basically at the assistant secretary level. In addition, the Metrication Operating Committee (MOC), composed of representatives from the same federal departments and agencies, coordinates interagency activities and reports to the parent committee, the ICMP. In turn, a series of subcommittees report to the MOC on a wide variety of areas relating to metric conversion. These include the Subcommittees on Public Education and Awareness, Construction, and Procurement and Supply.

The Nature of Metric Conversion

The metric system refers to units belonging to the International System of Units, which is abbreviated SI (from the French *Le Systeme International d'Unites*), as interpreted or modified for use in the United States by the Secretary of Commerce. By contrast, inch-pound units are based upon the yard and the pound. They include other customary units, such as the degree Fahrenheit.

The SI is constructed from base units that include standards of measure for everyday considerations such as length (meter) and mass (kilogram) as

well as a few units for more specialized measurements such as luminous intensity (candela). Prefixes in the SI are an essential feature of its simplicity. These prefixes are based on multiples of ten—for example, millimeters or kilometers.

The conversion from the inch-pound system to the metric system involves several key steps and decisions for federal agencies. The agency must first determine whether it has any “measurement-sensitive” elements in its operations. According to a Commerce definition, an element is considered measurement-sensitive if it includes any activities that use or generate numerical data having units of physical measurement (e.g., pounds, bushels, miles, kilometers, liters, acres, etc.). Measurement-sensitive elements may be found in federal laws, regulations, agency directives, specifications and standards, and other areas.

When a measurement-sensitive element is identified as being nonmetric, the agency must then convert it to metric units unless the agency decides that it meets the exceptions stated in the amendments to the Metric Conversion Act. If the agency decides that the number must be converted to metric units, it then faces several subsequent decisions. One of the most important decisions involves the choice between “soft” and “hard” conversion.

In general, soft conversion involves a change of number to metric units but no physical change. By contrast, hard conversion involves changing to an accepted standard metric size or a rational whole number of metric units and may also involve physically changing an object. A soft conversion is basically a “numbers only” effort that does not impose the additional burdens involved in making physical changes to products. Hard conversion, in requiring physical changes, tends to arouse greater resistance because of greater costs and other problems. In some cases, soft conversion is seen as a transitional or educational step that helps prepare for a later hard conversion.

A key technical aspect of conversion involves specifications and standards. The Federal Acquisition Regulation (FAR) defines a specification as a description of the technical requirements for a material, product, or service that includes the criteria for determining whether these requirements are met. The FAR defines a standard as a document that establishes engineering and technical limitations and applications of items, materials, processes, methods, designs, and engineering practices. It includes any related criteria deemed essential to achieve the highest

practical degree of uniformity in materials or products or interchangeability of parts used in these products. Federal agencies are facing the conversion of thousands of specifications and standards in their transition effort.

The History of Metric Conversion

Throughout its history, metric conversion in the United States has faced numerous problems. Looking back at this history helps to put in perspective the ongoing difficulties that affect the transition.

Commerce issued a 300-page history of the controversy¹ that identified the following five phases in the conversion effort:

- The period of consolidation (1786-1866): During this period, emphasis was placed on the achievement of greater internal uniformity in weights and measures by reducing the diversity of units that existed from state to state. It culminated in 1866 when the Congress legalized the use of the metric system.
- The educational movement (1866-1899): During this era, the primary goal of supporters of the metric system was to secure widespread acceptance and voluntary use by educating people about its advantages. Leaders of the movement assumed that no further legislation could be passed or would be effective until the people as a whole were ready for it.
- The movement to introduce the metric system through government adoption (1890-1914): In this era, the supporters of the metric system adhered to a strategy that called for rapid adoption of the system by the government, followed by a general transition by the rest of the nation. One of the assumptions was that the best way to acquaint the greatest number of people with the system was by adopting it for all government work.
- The propaganda period (1914-1933): This era saw the emergence of forces strongly promoting and strongly opposing metric conversion.
- The comprehensive study phase (1934-1968): This period culminated in 1968 with legislation directing the Secretary of Commerce to conduct a comprehensive investigation of metric conversion. The Commerce study authorized by this legislation and issued in July 1971 conveyed its basic message in the title: A Metric America: A Decision Whose Time Has Come.

Further efforts and difficulties in achieving metrication have occurred in the period since the issuance of the Commerce study. The Metric Conversion Act, enacted by the Congress in December 1975, did not

¹A History of the Metric System Controversy in the United States, Department of Commerce (Aug. 1971).

indicate a preference for one system over the other. The act established a Metric Board, representing a wide range of scientific, commercial, educational, and other interests. The Board, however, was not to advocate metrication but to assist various sectors when and if they chose to convert. The 1980s saw a period of reduced activity, as the Metric Board discontinued its efforts. The Amendments to the Metric Conversion Act in 1988 were designed to strengthen the transition effort, in particular by making the metric system the preferred system of measurement for the nation's trade and commerce.

Our previous report, entitled Metric Conversion: Plans, Progress, and Problems in the Federal Government (GAO/RCED-90-131, Mar. 30, 1990) provided an early look at the federal response to the Amendments. We found that serious difficulties might delay or prevent a timely and comprehensive conversion to the metric system. Federal agencies in general had not demonstrated a commitment to conversion, and Commerce in particular had not demonstrated a commitment to guiding the effort. In addition, agencies had not advanced beyond the early stages of planning. Only 6 among 37 agencies had completed their guidelines, and only one had developed a transition plan. Our report also identified a variety of other problems such as a limited dissemination of information about metric conversion among key officials, limited resources to support the transition, and difficulties in coordinating with the private sector.

Objectives, Scope, and Methodology

The Omnibus Trade and Competitiveness Act required us, at the end of fiscal year 1992, to review the implementation of the act and to report our findings along with any legislative recommendations. To conduct this review, we evaluated agency activities in (1) establishing metric guidelines and preparing reports, (2) using the metric system in procurements, (3) using the metric system in grants and other business activities, and (4) dealing with private sector and public attitudes toward conversion.

Because Commerce officials, in our initial meeting with them, identified procurement as the foremost difficulty in the conversion process, we gave special attention to this area. We focused our work mainly on three of the major procurement agencies, the General Services Administration (GSA), the Department of Defense (DOD), and the National Aeronautics and Space Administration (NASA). However, we also reviewed other agencies where we identified important, procurement-related problems or progress.

We also gave special attention to private sector and public attitudes toward conversion. Because these attitudes have a wide-ranging effect on the federal conversion effort, we reviewed them at appropriate points throughout the report. In particular, we attempted to clarify their role regarding difficulties in federal metric procurement and other business-related activities.

We based our overall work primarily on reports submitted to the Secretary of Commerce by all 14 federal departments and by selected key agencies such as GSA, NASA, and the Environmental Protection Agency (EPA). We relied on these reports, which were due in June 1992, because they represented the most comprehensive source of information about agency conversion efforts. In addition, we conducted interviews with officials from key departments and agencies and attended meetings of the ICMP, MOC, and several of the MOC subcommittees. We also made use of three other federal reports, two by Commerce² and one by the Congressional Research Service.³

We performed our audit work in Washington, D.C., between August 1992 and July 1993. Our work was conducted in accordance with generally accepted government auditing standards.

²Metric Transition Plans and Activities of Federal Government Agencies, Department of Commerce, National Institute of Standards and Technology, NISTIR 4911 (Aug. 1992); and Annual Report to the President as Required by Executive Order 12770, Department of Commerce (Oct. 1992). As of November 1993, the latter report had not been released to the public.

³Metric Conversion Activities of Federal Government Agencies in Compliance with P.L. 100-418, Section 5164, Metric Usage: 1992 Update, Congressional Research Service (July 1992).

Federal Preparations for Metric Conversion Are Well Under Way

In sharp contrast to the limited progress that we reported on in our 1990 report, federal preparations for metric conversion have advanced dramatically. All 14 federal departments and almost all federal agencies have issued guidelines for their metric conversion activities. In addition, almost all of the departments and agencies have developed conversion plans and provided progress reports to either the Congress or the Secretary of Commerce, or both. In many cases, the reports indicate not only involvement by headquarters officials but extensive preparations throughout federal departments and agencies. A few agencies, however, showed limited evidence of preparations. In particular, the Department of Education, which has a key role to play as chair of the federal MOC's Subcommittee on Education and Public Awareness, has continued to make only limited progress.

Agencies Have Developed Guidelines and Plans

As noted in chapter 1, federal agencies are expected to meet two sets of requirements. The Amendments to the Metric Conversion Act require that, in preparation for the metric transition, the agencies develop guidelines and report to the Congress on their progress. In addition, Executive Order 12770 requires the agencies to, among other things, formulate metric transition plans and report annually to the Secretary of Commerce on their progress.

At the time of our 1990 report, only six federal departments and agencies had reported that they had completed their guidelines. Since then, this situation has improved. A July 1992 review conducted by the Congressional Research Service (CRS) found that, according to reports submitted to the Congress, 9 federal departments and 9 agencies had created guidelines. The Department of Labor, however, did not indicate that it had developed guidelines. The Departments of Transportation (DOT), Education, Housing and Urban Development (HUD), and Justice and the Environmental Protection Agency (EPA) did not provide reports to the Congress in 1992 and thus were not analyzed in this part of the CRS review.

In following up on these cases, we found that Labor issued a Secretary's Order in July 1992. DOT has issued an internal directive along with metric conversion planning guidelines. Education, HUD, and Justice have developed draft documents for metric conversion. Thus, 11 of the 14 federal departments have issued guidelines or orders, and the other three departments have developed draft materials. In August 1992, EPA submitted a detailed report to Commerce that reviewed the agency's own

activities. The report included an EPA Order to increase the use of the metric system within the agency.

Although our 1990 report also found that only one federal department, DOD, had completed a transition plan, progress in this area has also been substantial. As part of Commerce's role in helping to coordinate government-wide metric activities, the National Institute of Standards and Technology (NIST) issued a report in August 1992 that reviewed the plans provided by 34 federal departments and agencies.¹

In its executive summary, the NIST report stated that all executive departments have draft, partial, or final metric transition plans. It also stated that most major independent agencies have completed their plans. The report concluded that the large majority of federal agencies are committed to the metric transition process and have made significant progress. It noted, however, that the range of progress from agency to agency is broad and that some of the differences result from programmatic factors. Some agencies, for example, are much more involved than others in procurements, grants, regulations, and other business-related activities. In addition, a few agencies do not yet have comprehensive metric transition plans, according to the report; instead, these agencies have only general outlines or plans that cover only a few operating units, which do not constitute agency-wide plans.

The NIST report provides an example of effective leadership by Commerce, the lead agency for the federal metric transition.² The report has performed a valuable service by developing a common format for analyzing all of the agencies' plans. One official, who played a major role in writing the report, noted that the plans followed no systematic format; as a result, officials responsible for preparing the report organized the review of each plan in six sections to cover major areas of activity.³

¹Metric Transition Plans and Activities of Federal Government Agencies, National Institute of Standards and Technology, NISTIR 4911, (Aug. 1992).

²Besides officials from Commerce, two officials from Treasury and DOT also played key roles in organizing and writing the report.

³These included directives such as administrative orders and guidelines; responsibilities of specific officials; reporting requirements; exceptions to metric usage; transition efforts; and examples of significant developments in implementing the plan.

Agencies' Reports to the Secretary of Commerce Indicate Additional Progress

In addition to submitting reports to the Congress and transition plans to Commerce, agencies submitted progress reports to the Secretary of Commerce as required by the executive order. In fact, all 14 federal departments and key agencies submitted either draft or final reports to the Secretary. These reports ranged from highly detailed assessments of metric activities and progress to draft orders that only outlined basic policies and responsibilities.

As the lead agency, Commerce developed guidelines for the reports. To ensure that the information in the reports was measurable and specific, the guidelines prescribed the content and format for the reports. The guidelines were also aimed at establishing a structure for future annual reporting so that agencies would only need to develop a single annual report suitable for both the Congress and the Secretary of Commerce. Toward this aim, the guidelines provided a detailed list of 12 points for discussion in the reports.⁴ In our view, the information requested by Commerce was both appropriate and comprehensive in its coverage of all the basic aspects of metric conversion. A review of the reports provided to the Secretary indicates that most federal departments and key agencies adhered to the guidelines, and thus the reports provided a systematic overview of the entire range of federal conversion activities.

Many departments applied the guidelines to each of their major areas of concern or to their component agencies. For example, DOD used the guidelines in analyzing each of its major areas such as weapon systems, electronics, and construction. Many other departments such as the Department of Energy (DOE), DOI, DOT, Health and Human Services (HHS), and Treasury applied the guidelines to their component agencies. For example, DOE's Office of Defense Programs, Office of Civilian Radioactive Waste Management, Office of Energy Research, and other components each prepared an analysis of its activities in accordance with the guidelines. This 12-point approach that the departments followed with each of their agencies led to extremely thorough analyses of the conversion effort in many of the major federal departments.

These reports in turn provided a comprehensive basis for preparing the Secretary of Commerce's report to the President, as required by the

⁴Guidelines for the June 1992 reports stated that agencies should discuss the program element; supporting activities such as procurements or grants; measurement sensitivity; conversion status and sensitivity; transition timetable; federal, state, and local consultations; standards; private industry initiatives; public awareness initiatives; employee training; problems, barriers, and impediments; and recommendations. The guidelines for the June 1993 reports required a discussion of the first 10 points but did not require a discussion of the problems, barriers, and impediments or the inclusion of recommendations.

executive order. The report was dated October 1992 and transmitted to the President in April 1993. It stated that a large majority of federal agencies are committed to conversion but that their rate of progress is uneven. In brief discussions, it summarized the conversion status of procurement, grants, and other business-related activities. It also discussed a variety of other areas including private industry and public awareness initiatives. Furthermore, it provided a list of six problems and recommendations. One of the problems it identified is that federal agencies' metrication activities alone may not be sufficient to achieve the goals of the Executive Order. According to the report, some federal agencies question whether reliance on federal procurements, grants, and other business-related activities to indirectly promote the conversion will ever be fully effective. (The reasons for these agency views are discussed in subsequent chapters.) The report also stated that other measures may ultimately need to be incorporated into the effort. These measures might involve other sectors of the nation.

A Few Agencies Needed Further Review

Federal departments and agencies had three opportunities during 1992 to provide information indicating their progress regarding metric guidelines, plans, and other activities. These opportunities included submitting (1) their 1992 report to the Congress, (2) their transition plan to NIST for inclusion in the NIST report, and (3) their 1992 report to the Secretary of Commerce. In reviewing the reporting activities of federal departments and agencies, we found that EPA and Justice had provided no report to the Congress and were not included among the 34 departments and agencies discussed in NIST's review of transition plans. Two other departments, HUD and Education, provided no report to the Congress and developed only draft orders for use in the reports by NIST and the Secretary of Commerce. The first three are discussed in this section while Education is discussed by itself in the following section.

Although it provided no report to the Congress or plan for review by NIST, EPA submitted a progress report to Commerce in August 1992. The report notes that EPA established a policy encouraging the use of the metric system in 1975 and reaffirmed that policy in 1985. It also states that EPA's standards and monitoring data rely almost exclusively on metric units, although some data use inch-pound units or a combination of inch-pound and metric units. This dual approach results not only from historical practices at the federal and state levels but also from statutory language that specifies a nonmetric unit (e.g., miles per gallon). The report cites basically three impediments to further conversion: the need to preserve continuity of nonmetric data, the remaining mandates requiring

inch-pound measures, and public attitudes favoring inch-pound measures. The report recommends the avoidance of inch-pound units in future legislation and, if conflicts remain, better coordination through the ICMP to promote metric units.

EPA's Metric Coordinator said that the agency achieved a history of being metric long before there was a requirement to develop a transition plan. Partly as a result of this circumstance, the agency did not develop such a plan. The metric coordinator added that, in retrospect, the agency should have developed a plan to avoid confusion about the status of its transition. In general, however, the agency is planning no further significant changes relating to metric conversion.

The metric coordinator also said that EPA had not provided a report to the Congress in 1992 because the agency believed that it had already completed its metric conversion activities. However, in response to concerns about the status of the transition at the EPA and a request from the Secretary of Commerce, EPA submitted a report to Commerce in August 1992.

Justice also provided no report to the Congress and was also the only federal department omitted from NIST's discussion of transition plans because it did not provide timely information. It later submitted an assessment on metric conversion to Commerce in September 1992. The report provides a careful overview of Justice's efforts to demonstrate, through the department's business-related activities, a preference for metric units and metric products. Among the key program elements, it identified prison construction, federal prison industries, and general department-wide procurement. The report discusses the transition status of various product divisions such as clothing and textiles, furniture products, and other aspects of its measurement-sensitive activities.

HUD's draft "Notice of Metric Policy and Metrication Program" was the only document that it submitted to Commerce officials. It is analyzed in NIST's report on transition plans. NIST stated that the draft notice does not provide a discernible plan that iterates milestones, tasks, and proposed accomplishment dates. However, according to NIST, the notice does offer procedures that could be used for planning and implementation purposes.

The Department of Education Has a Key Role but Has Made Limited Progress

The Department of Education has a key role to play in fostering federal metric conversion. The amendments to the Metric Conversion Act require agencies to seek out ways to increase understanding of the metric system through educational information and guidance. The MOC designated Education as the lead agency in these matters by making it the chair for MOC's Subcommittee on Public Education and Awareness.

Education, however, has made very little progress since our review 3 years ago. In our March 1990 report, we stated that general policies or specific actions had not been determined regarding Education's support for conversion to the metric system. We also stated that knowledge of the metric system is not one of the national goals prescribed by Education for high school graduates, but the Department is considering what can be done to include it among these goals. We further noted that the president of the U.S. Metric Association (USMA), a nonprofit organization promoting the use of the metric system, expressed concern about the slow pace of activity in Education. Each of these statements remains accurate in 1993.

Education prepared a draft transition plan in May 1992. According to the Department's metric coordinator, this plan had not been revised or finalized as of November 1993. The time frame for revision and approval remains uncertain. Education issued a rule on acquisition regulations in May 1993. The regulation is focused on contract-related activities and provided notice to the Department's customers and vendors that Request for Proposal responses that included metric measurements would be accepted and encouraged.

With regard to knowledge of the metric system as a national educational goal, the metric coordinator told us that such knowledge could be linked with two of the six national goals established by the Department. He said that the fourth goal was especially relevant. This goal states that, by the year 2000, U.S. students will be first in the world in science and mathematics achievement. The fifth goal states that, by the year 2000, every adult American will be literate and will possess the knowledge and skills necessary to compete in a global economy. According to the metric coordinator, Education has not decided whether to include metric education among these goals but is once more considering it.

The lack of greater progress at Education has continued to arouse concern within the USMA. In a document emphasizing the importance of metric education, the USMA remarked that statements of a general nature abound regarding education reform, but specifics are very often lacking. Among

those who have conspicuously avoided strongly recommending the teaching of the metric system as the primary measurement system, according to the USMA, are Education and national education organizations.

Education's metric coordinator cited several reasons for these difficulties. He told us that responsibility for metric issues has been a matter of uncertainty within the Department. The uncertainty has centered on whether conversion is a programmatic or administrative issue. As of March 1993, a program official, the Assistant Secretary for Elementary and Secondary Education, is responsible for metric activities. However, Education attorneys have viewed conversion as an administrative issue relating to contracts and grants rather than as a Departmental program. The metric coordinator believes that responsibility will remain in the program area, but he does not believe that Education will make a stronger commitment to promoting conversion.

In addition, the metric coordinator pointed out the high degree of autonomy in the American system of education and the Department's reluctance to "impose" a national curriculum that would include explicit reference to metric conversion.⁵ In this regard, he noted that not only the Department but other national education organizations have hesitated to endorse metric education as a matter of policy. He also pointed out that schools are teaching the metric system in mathematics and science courses, indicating that metric education is already helping to prepare students for its usage. As yet another factor, he noted that the Department perceives a general public resistance to the metric system and believes that greater emphasis on metric education might limit their pursuit of other objectives.

Given this situation, the metric coordinator told us that Education plans to place somewhat greater emphasis on a generalized public awareness effort rather than a more direct commitment to metric education. Education serves as the lead agency for the Public Education and Awareness Subcommittee, and the Department's metric coordinator acts as its chairperson. In January 1993, the chair of the MOC asked the coordinator to identify objectives and to develop a plan for the remainder of 1993. The MOC chair suggested two objectives: (1) a plan and recommendations for a comprehensive public affairs strategy for conversion and (2) initiation of

⁵In commenting on our draft report, the Department's Assistant Secretary for Elementary and Secondary Education stated that the Department is limited by its organizational statute that prohibits the Department from prescribing or mandating any area of curriculum.

an outreach effort to the educational community that would include model curricula.⁶

Conclusions

In contrast to our findings three years ago, federal preparations for metric conversion are now well underway. In general, agencies have responded effectively to the Amendments to the Metric Conversion Act and the executive order. They have established guidelines and plans, many of which reflect a thorough analysis of their conversion efforts. As of January 1993, all of the major agencies submitted draft or final reports to the Secretary of Commerce that provided further information about their activities. Only the Department of Education, a key agency with important metric responsibilities, continues to arouse our concern because of the limited actions it has taken in fostering metric education. Lacking finalized guidelines and a finalized transition plan, it has made limited progress in defining its metric role since our report in March 1990.

⁶In commenting on our draft report, the Department's Assistant Secretary stated that agency representatives lack the time, authority, or resources for implementing the ambitious plans envisioned by Commerce. However, he notes that the subcommittee is exploring the development of a public affairs policy guide on the use of metric units in press releases and other communications.

Basic Problems Limit Federal Metric Procurement

Despite improvements in planning and reporting, the progress of federal metric procurement has been limited by several basic problems. These problems involve (1) the extensive nonmetric environment in which federal agencies are operating, (2) the limited "leverage" of federal procurement in overcoming private sector resistance to conversion, and (3) a variety of other problems, including limited support from high-level officials and a lack of adequate guidance in responding to the obstacles. The combination of these factors has exerted a potent influence in slowing the pace and limiting the scope of metric procurement in federal agencies. The proposed or approved use of waivers from metric procurement requirements indicates further difficulties. One outstanding exception to these procurement problems involves federal construction. Building construction by federal agencies, which amounts to about \$40 billion annually, is scheduled to convert to the metric system by 1994; currently, building projects valued at about \$12 billion are using metric measures. In general, however, federal progress in metric procurement remains limited, and federal efforts to deal with procurement issues face many problems.

The Nonmetric Environment Limits Metric Procurement

For procurement purposes, the nonmetric environment takes two forms: the domestic, private sector products that are generally nonmetric and the existing federal infrastructure that is also nonmetric. Whether purchasing simple, "off-the-shelf" goods from the private sector or maintaining weapon systems and space shuttles, federal agencies are faced with a nonmetric environment that poses a huge obstacle to metric procurement. This section summarizes the nonmetric environment faced by GSA, DOD, and NASA.

In contrast to DOD and NASA, which procure unique, non-commercial systems as well as commercial products, GSA focuses its procurement activities primarily on the commercial marketplace. Private sector manufacturers and suppliers set the measurement-sensitive dimensions for most of the products acquired by GSA. These products, which are intended for the entire American market rather than for GSA in particular, are generally designed according to nonmetric standards and specifications.

GSA's metric coordinator told us that GSA is actively engaged in conversion but is encountering barriers in the private sector. In particular, the Federal Supply Service (FSS), the agency within GSA responsible for "off-the-shelf" acquisitions of paints and other commodities, is having difficulty buying metric products from its suppliers. In its July 1992 report to the Secretary

of Commerce, GSA stated that its most significant problem within FSS concerns the FSS vendors or supplier base which consists primarily of small, or relatively small, businesses that do not sell outside the United States and that have no interest or desire in making metric products. FSS officials also pointed out that procurement policy directs them to "buy commercial" products, a policy that increases the agency's dependence on what the private sector is willing to provide. By contrast, in situations where GSA writes its own specifications and standards (for instance, in building construction) rather than purchasing commercial goods "off the shelf," GSA is finding somewhat greater opportunities to make a meaningful metric conversion.

DOD identified the nonmetric environment in both the private sector and its own infrastructure as obstacles to progress. In the letter transmitting its June 1992 report to the Secretary of Commerce, the Assistant Secretary of Defense for Production and Logistics stated that the salient impediments to increasing metric usage in DOD are: the statutory mandate to buy commercial items whenever they meet DOD's needs and the continuing requirement to support the inventory of weapon systems and other military materiel that was designed and produced in the inch-pound system. The report also stated as DOD policy that the measurement units in which a system was designed will be retained for the life of the system, unless it is more advantageous to convert to the metric system. The existing inch-pound weapon systems and support equipment, according to the report, will remain unchanged in virtually all cases. Thus, the report concluded that the great bulk of DOD materiel will be inch-pound for a long time to come.

In its January 1992 report to the Congress, DOD also pointed out that many of its more current weapon systems have not made the conversion. DOD stated that many systems now in production and being fielded were started before issuance of the DOD metric policy or the passage of the Amendments. According to DOD, since it is common for the development of a weapon system to take 10 years or more, many systems now "coming through the pipeline" preceded the metric requirements.

Similarly, the nonmetric infrastructure in NASA limits its progress. In its August 1992 report to the Secretary of Commerce, NASA stated that it has a very large investment in major flight and ground systems that use the inch-pound system, including the space shuttle, the space station Freedom, launch facilities, and wind tunnels. In discussing three major program elements, NASA stated that (1) there will be no conversion of the

space shuttle and ground systems to metric units, (2) conversion of the space station to the metric system would be impractical and costly, and (3) existing ground systems such as tracking stations will operate with inch-pound units for several decades before needing replacement.

Federal Metric Procurement Exerts Limited Leverage and Faces Other Problems

Although procurement of metric products is an important part of federal conversion, the government is not a large enough customer to motivate private sector suppliers in developing metric products. In many product lines, such as paints or soaps, the government buys less than one percent of private sector output. In addition to its lack of leverage, federal metric procurement faces other problems. These include private sector resistance to conversion that affects many agencies; inadequate support for conversion and a lack of involvement by procurement experts, according to officials in DOD; and the use of metric waivers that also limits metric procurement.

GSA's Experience Indicates Limited Leverage

GSA's procurement of commercial metric products is facing difficulties because of the agency's limited leverage over the private sector. This is true of many commercial goods obtained by FSS for use throughout the government. FSS officials told us that, even in areas where FSS procurement might be expected to exert greater leverage, their ability to influence conversion was limited. For example, FSS demand for copier paper accounts for only about one percent of the total market; industry is not interested in conversion to cover such a small share.

FSS supported this view with data on its procurement as a percentage of total industry sales. The data listed 15 major commodity areas. These included soaps and other cleaners; paints and related products; six types of "white goods" such as washers and dryers; office chairs; filing cabinets; and five kinds of paper. In 10 areas, FSS procurement represented less than 1 percent of total industry sales. In the remaining five areas, office chairs and filing cabinets accounted for the highest percentage, each amounting to 5.9 percent.

Despite efforts to inform suppliers of FSS' interest in purchasing metric products, FSS officials found strong resistance to conversion and few metric products in the private sector. The FSS Deputy Commissioner noted that suppliers see no immediate financial advantage in conversion. Many have no sales to foreign markets and thus have less incentive to convert.

Also, about 60 to 65 percent of them are small businesses that might have difficulty absorbing the costs of conversion.

As further evidence of the lack of private sector motivation, officials referred to a survey of 68 industry suppliers of such items as paint cans and paper. Overall, 46 companies and trade associations replied to the FSS survey. As stated in an FSS memo summarizing these contacts, few offered metric products; half of those replying were willing to go along with a soft metric conversion.

As one example, a July 1991 letter from The Soap and Detergent Association to FSS expressed reservations about conversion. These reservations include problems with packaging redesign, potential exclusion of smaller companies, conflict with GSA procurement policy (relating to commercially available products), and end-user confusion. The letter further states that measurement systems must follow the general market and that effective conversion to the metric system can occur only when there is general acceptance by society at large. The letter concludes that soft metrication is a viable option but that full metrication for the purposes of government procurement ought not to be pursued at this time.

FSS officials said that, because of the barriers in the private sector, their primary metric activity consists of the "soft" conversion of their specifications and standards. (For example, they are moving forward with a complete soft conversion of their specifications for acquiring furniture.) They regard soft conversion as a transition toward a hard conversion when industry has become more receptive to metric products. They view soft metric measurements as an educational tool that encourages people to think in metric terms and thus helps prepare for the transition. This soft conversion is occurring as FSS goes through its customary 5-year review cycle for updating each of its specifications and standards. Thus, it is proceeding without any special effort to accelerate its completion.

Other agencies have expressed concern about FSS' difficulties because they make their purchases based on "schedules" developed by FSS. The schedules, according to the Deputy Commissioner, are simply lists of products reflecting what is commercially available. These lists account for by far the largest portion of FSS' products. In response to this concern, the Deputy Commissioner emphasized that these schedules must reflect the current market offerings and that the schedules will contain more metric items if and when the market moves in that direction.

DOD Has Encountered Metric Procurement Problems

DOD has also faced difficulties with metric procurement. It not only shares GSA's problem of limited leverage over commercial products, but it has had little success in procuring more specialized products. DOD cited numerous reasons for these problems, including its policy of maintaining existing weapon systems in their original, nonmetric units and its declining role in the procurement of new weapon systems. In reviewing DOD's conversion problems, we also identified a split within DOD between technical and policy-related activities that further limits metric procurement. DOD technical officials do not believe that they have either the authority or resources to implement metric procurement; they also believe that the higher, policy-level officials lack a commitment to metric procurement for various reasons, including potential conflicts between metric conversion and other priorities. In addition, DOD reports may overstate the extent of progress in metric weapons procurement by including systems that contain only a small percentage of metric components.

DOD Officials Cited a Lack of Leverage in Commercial Procurement

DOD officials cited the Department's limited—and further decreasing—influence in procurement of commercial (as contrasted with military) items. DOD is relying to a greater extent on civilian goods, which are generally nonmetric, and it is buying fewer goods overall, which provides even less leverage over the market. In its June 1992 report to the Secretary of Commerce, DOD gave statistics illustrating its lack of leverage. In discussing food procurement, DOD stated that it purchases about \$7.6 billion, or slightly more than 1 percent, of the total food purchased in the United States. DOD noted that there is a widespread practice within the food industry of “dual labeling” of food packages, almost always using inch-pound units with metric equivalents in parenthesis. In a DOD survey of the food industry, however, 99 percent of the responses were not supportive of further metrication. The few manufacturers producing or planning products in metric sizes indicated that, in most cases, DOD would have to pay a premium price. Test, measurement, and diagnostic equipment, however, is making progress. This includes all Army, Navy, and Air Force equipment used to measure, gauge, test, or inspect. Inventories by the armed services show relatively high percentages of “metric-capable” equipment in these areas.

DOD Officials Cited Two Further Problems Regarding Metric Weapons Procurement

DOD officials involved in metric conversion activities cited two further problems that relate primarily to the procurement of metric weapon systems. First, they described a lack of high-level support for conversion among DOD's procurement policy officials and program managers who are responsible for weapon system development. Second, they described the contrasting emphasis on a “low-level” approach involving the conversion

of specifications and standards. In their view, this technical approach cannot drive the development and procurement of metric weapon systems, especially when the technical activity is poorly supported and conducted on an ad hoc basis.

Standardization officials in the Army, Navy, Air Force, and the Office of the Secretary of Defense expressed the view that high-level procurement policy officials need to be involved if metric progress is to occur. However, DOD's Office of Defense Procurement has remained virtually uninvolved. An official with this office confirmed the lack of involvement, stating that the office views metric conversion as solely a technical issue. He added that the Office of Defense Procurement considers the FAR "measurement-blind" and said that, from the standpoint of procurement, it makes no difference what the measurement system might be. The DOD Metric Coordinator said that, because of this view, officials in the Standardization Program Division and the Office of Defense Procurement were holding no discussions on metric procurement. He said that there needs to be a dialogue but that the procurement policy office has remained almost completely uninvolved.¹

In addition to the lack of support from procurement policy officials, DOD's standardization officials discussed the difficult decisions faced by the PMS. They pointed out that the PMS have substantial authority in developing weapon systems. The PMS bear all the responsibility and risks for delivering a system that meets its budget, schedule, and performance requirements. Metric conversion is only one among several considerations. A new approach that included conversion but also involved cost increases or schedule delays would heighten the chance of a request for a metric waiver. According to the standardization officials, the PMS have seldom, if ever, expressed support for conversion.

In part because of the lack of high-level support, DOD's standardization officials believe that DOD is emphasizing a technical approach involving the

¹A deputy director in the Office of Defense Procurement described more fully the reasons for his office's lack of involvement during a July 1993 follow-up meeting. Among the reasons, he stated that his office deals with "how" something is purchased rather than "what" is purchased. In this respect, he confirmed the earlier statement by a member of his office that the FAR is measurement-blind and does not care what measurement system is used. A second reason involved the desire to avoid making the FAR more cumbersome. In his view, additional details and guidance on various issues, including metric conversion, would offset the efforts to streamline and simplify procurement regulations. As a third reason, he stated that neither the Office of Defense Procurement nor the Standardization and Manufacturing Division has the "clout" to force conversion. He said that the real decisionmaking authority resides with the Program Managers (PM), who oversee the weapon systems, and the division heads, the admirals and generals who can select the metric option if they see it as being in the best interest of DOD.

conversion of specifications and standards. However, these officials doubted that this approach would be effective. They said that the conversion of specifications and standards is a relatively low-level activity, whereas conversion depends upon high-level support from procurement policy officials and the PMS. According to DOD's metric coordinator, procurement needs a metric bias that only higher-level decision-making can provide to make conversion successful.

Standardization officials also expressed their view that the technical approach is not adequately supported. An Army standardization official told us that the Army Standardization Office is dealing with more initiatives (such as a shift to commercial standards, environmental issues, and metric conversion) while resources to support them are being reduced. The Navy Material Metrication Project Officer said that engineers are responsible for converting technical documentation, including specifications and standards. However, these engineers have other duties, extending from doing routine specifications work to finding technical solutions for emergencies at sea, that take precedence over conversion. Their metric activities are largely "ad hoc," a task undertaken when no other duties demand attention. The Director, Air Force Departmental Standardization Office, said that there is virtually no support for conversion. He said that the only specifications and standards receiving attention are those in support of immediate acquisition activities, not longer-range prospects such as metric conversion.

Thus, in general, a split exists within DOD between the technical and policy areas. Each side points to the other as the appropriate focal point for progress in conversion, but neither side is able to resolve the problem. The technical side, in its view, has neither the needed authority nor resources while the procurement policy officials and PMS are generally uninvolved.

DOD Reports May Overstate Progress in Metric Weapons Procurement

For fiscal years 1988 through 1991, DOD's Annual Metric Reports to the Congress reported a total of 65 weapon systems with metric components in the Production Phase, and 89 with metric components in the Research, Development, Test, and Evaluation Phase. Many of these systems and subsystems, according to the January 1992 report, are "hybrid;" that is, they are partly metric and partly inch-pound. This report cites various examples, including the Army's Commanche helicopter and a Navy trainer plane. The report also states that, in addition to weapon systems, the services have had significant acquisitions of metric-designed support equipment.

However, the degree of actual metrication is not clear from the annual reports, which provide only a list without detailed discussion. The original reports furnished by the Services, on which the January 1992 report was based, also contain only a list with almost no further information. One of the few details was furnished by the Navy in a summary of its success stories. It stated that acquisition of small craft such as utility boats is rapidly changing to metric units.

DOD's metric coordinator stated that the degree of metrication in DOD weapon systems is often difficult to determine. He said that, for several metric weapon systems, he had seen estimates that their metric components amounted to only about 5 percent of the total systems. We noted that DOD's July 1992 report to the Secretary of Commerce concluded that the great bulk of DOD materiel will be inch-pound for a long time to come.

The Commanche Helicopter: a DOD Metric Success Story

In contrast to these metric procurement problems, one weapon system provides a DOD metric success story. DOD's metric coordinator described the Commanche, a light helicopter designed for reconnaissance and attack, as DOD's "showcase metric example." He said that the Commanche propulsion system is virtually 100 percent metric. He also noted that the Commanche was the first "home-grown" system to be fully metric. Other DOD metric weapon systems, such as a Navy trainer plane, were derived from European metric designs.

One significant advantage emerged from the metrication of the Commanche helicopter: the tool kit needed to overhaul the engine was reduced from 40 tools to only 6. A potential advantage has also emerged: the prospect of a more lucrative overseas market for the engine once it is fully "qualified" or tested and found reliable.

At present, however, the Commanche program has been drastically scaled back from original plans for a large production run. Three prototypes are authorized for actual construction, but there has been no approval for full-scale production of the helicopter.

NASA's Metric Procurement Is Limited

In its August 1992 report to the Secretary of Commerce, NASA discussed its limited leverage over the private sector. It noted that industry provides the hardware and support services for most NASA programs. However, according to the report, few commercial sources provide supplies and equipment in metric sizes or produce metric hardware that meets

aerospace requirements. Because NASA is not a major customer in any market except the space industry, according to the report, the ability to influence the market through demand supporting NASA contracts is limited. This situation, the report concludes, could result in NASA requests for metric hardware becoming "special orders" only, with possible cost differences and safety concerns when both measurement systems are in use.

NASA has begun to gain experience with metric procurement through two pilot programs involving proposed satellite systems. The two programs are developing satellites for measuring tropical rainfall and surveying the environment of Mars. NASA's metric coordinator noted that only certain portions (or subsystems) of the satellites are being considered for metric conversion. These include, for example, the main frame of each satellite system as opposed to the "inherited" hardware such as gyroscopes or propulsion.

The metric coordinator said that important support for metric usage in these two projects has come from the Deputy, Office of Space Science and Applications (OSSA). A number of meetings at the NASA field centers developing the satellites have also helped to promote the conversion. Another factor has been the policy requiring a special waiver if a decision is made to remain nonmetric. According to the metric coordinator, this policy has provided a substantive process for addressing metric issues.

The metric coordinator told us that, in his view, OSSA is making the most progress toward conversion among the various NASA agencies. OSSA has developed an "Integrated Mission List" identifying all currently funded and planned OSSA payloads in relation to their metric, inch-pound, or hybrid units of design. Of the more than 100 missions included in the list, 65 are designated as metric and 32 as hybrid. As of July 1993, however, only the two satellite systems described above have made significant progress in the procurement cycle.

Waiver Requests Indicate Further Problems but May Contain a Promising Solution

Both DOD and NASA have developed procedures for reviewing and approving waiver requests. Designated officials in DOD may grant waivers on a case-by-case basis if the use of the metric system is not in the best interest of the DOD. A request for a waiver in NASA must be supported by an assessment of the entire program that demonstrates a significant adverse impact would arise from using the metric system.

DOD and NASA program officials have requested waivers from metric conversion relating to the procurement of new systems. In its report to Commerce, DOD stated that, with regard to new systems in the acquisition process, waivers increasingly are being sought when conversion is seen as not in the best interest of DOD. Two waivers have been granted at DOD and four at NASA. Others are under review in both agencies. In dealing with their waiver requests, both agencies have begun to take a "subsystem" approach, identifying portions of a system that can be converted rather than waiving the entire system. This potentially valuable approach is discussed at the end of this section.

In its January 1992 report to the Congress, DOD identified two Navy waiver requests (for an oceanographic research ship and a submarine combat system) that had received approval. It cited two other Navy systems (involving amphibious warfare ships and strategic sealift ships) for which waivers were in process. It listed three Army systems (an all-terrain lifter, a crane, and a fueling system) that were approaching a decision whether to request a waiver. In following up on these potential waivers, we found that the Navy withdrew its waiver request for the amphibious warfare ships, a decision that is discussed in more detail later in this section. As of July 1993, the Navy was still trying to exempt the strategic sealift ships from being a fully metric program because of concerns about potential cost increases and schedule delays. The Army has decided that, regarding the all-terrain lifter and the crane, it will incorporate metrication to the maximum extent possible by following guidelines set forth by commercial industry. It has also decided that it will use metric units in developing the fueling system.

NASA had processed four waiver requests as of October 1992. It granted waivers for two of the space science programs mainly because of their "inherited" designs or hardware that made conversion impractical. It granted a third waiver based on considerations involving rapid implementation, low cost, and maximum use of existing designs. The fourth waiver, which deals with the Tropical Rainfall Mapping Mission (TRMM), involves a scaling back from plans for a total conversion to a use of hybrid units.

In dealing with waiver requests, both DOD and NASA have begun to explore the merits of a subsystem approach to conversion. As shown in two cases (involving the Navy's amphibious ship and NASA's TRMM satellite), this approach may be valuable in identifying parts of a system that can be converted rather than waiving the entire system.

The Navy waiver request for the amphibious ship and the opposition it stirred up within DOD deserve special attention. The request, which involved the development of assault ships intended to replace 41 warships, represented a major procurement in which the Navy withdrew its waiver request. Opposition by metric officials and eventual support for a "subsystem" approach by the PM led to this withdrawal in November 1992. A memo stated that the program is not seeking a waiver and that, to the extent practicable, within the constraints of schedule and cost, the ship will be "hybrid." Among the metric elements slated for development as of July 1993, a Navy standardization official identified the hull design, the layout of compartments on each deck, and the structural design of the ship as well as utility boats and other items. Among the potential metric equipment, the official identified the main propulsion diesel engines, a large crane, steering gear, and other items.

At NASA, the waiver request for the TRMM satellite included a detailed list of subsystems such as communications, power, and reaction control. For each of these, the list differentiates between "existing design," which tends to be nonmetric, and "new design," for which the potential for metric is somewhat greater. The component parts are then described as metric, inch-pound, or hybrid, followed in many cases by comments further explaining the decision. In commenting on this approach, NASA's Associate Administrator for Safety and Mission Quality stated in a memo that the subsystem analysis is an excellent approach to making decisions and identifying issues.

We agree with this assessment of the subsystem approach. It provides a logical alternative to the "all-or-nothing" approach that may not be realistic in an extensively nonmetric environment and that may lead to requests for total metric waivers. It represents a useful compromise between these two extremes and may be applicable in many situations.²

GPO's Experience Reflects One Major Barrier

The Government Printing Office (GPO) is currently implementing a plan for metric conversion in its production and procurement of government publications. In addition to producing passports and microfiche in metric sizes, other metric products are being produced or procured for federal

²Commerce's National Oceanic and Atmospheric Administration (NOAA) is taking a similar approach with its ships. Although its existing fleet of 21 ships was constructed using inch-pound units, NOAA will attempt to use the metric system in all future ship construction, maintenance, and repair programs to the highest degree possible. The Program Manager for the NOAA Fleet Replacement and Modification program told us that NOAA is working on two new metric ships and that he will take a subsystem approach. He said that total metric conversion was unrealistic and would risk alienating major suppliers.

agencies on an increasing scale. However, one apparent obstacle to a fully successful conversion is the inability of certain types of printing presses, standard throughout the printing industry, to economically print one of the more common standard metric paper sizes. This size, known as "A-4," is especially important because it represents the international standard size for business correspondence that would replace the 8.5-by-11 inch paper in widespread use.

The difficulty became evident when, at the request of the Internal Revenue Service (IRS), the GPO attempted to procure two publications (involving 800,000 and 1.6 million copies) in the A-4 size. The GPO found that its printing contractors responded with bids over 30 percent higher than the cost of printing the jobs in the 8.5-by-11 inch size and therefore cancelled the bid.

The reason for the cost increase involved the large amount of paper that would be wasted. The waste is attributable to the press being capable of printing only one of the longer A-4 pages in the same space that two 8.5-by-11 inch pages can be printed. As a result, the excess paper would have to be trimmed off and discarded. The printers told the GPO that the only way to avoid the waste would be to buy new presses designed to produce the A-4 size. The episode shows the problems that in some cases may accompany a hard metric conversion, in which the actual physical dimensions of a product must be changed.

Metric Procurement Is Making Progress in Construction

In contrast to the numerous problems facing federal metric procurement, the use of the metric system in federal construction projects shows a great deal of progress. In particular, building construction has become a focal point for metric conversion. The MOC Construction Subcommittee has played a leading role in facilitating the conversion of all federal construction, a \$40 billion annual expenditure. During the summer of 1991, the subcommittee established a goal of using metric units in the design of all new federal facilities by January 1994.

The subcommittee's work is now being carried forward by the Construction Metrication Council, a part of the National Institute of Building Sciences (NIBS). The Council, a private sector group, has obtained funding from numerous federal agencies to broaden the work of the subcommittee. The Council's Executive Director has organized regular monthly meetings where federal and private sector officials have discussed a wide range of topics relating to conversion. These have

included federal and private sector metric projects as well as technical areas such as mechanical and electrical equipment.

GSA's Public Buildings Service has also played a key role in fostering this progress. It provided the majority of funding for a "Metric Guide for Federal Construction" in 1991. A GSA project manager in the Office of Design and Construction developed a draft "Metric Design Guide" that provides detailed information relating to numerous aspects of design and products used in construction. This official commented that virtually any project can use the metric system in its design and construction. He added that all hard metric products for commercial construction are available from at least three respected domestic sources at little to no cost premium.

In addition to this availability of "hard" metric products, the project manager commented on the importance of the "soft" approach to conversion in the "Metric Design Guide." In fact, according to the report, over 95 percent of the products used in building construction will undergo no physical change at all during the metric transition. All that will occur is that the dimensions of the product will be identified in drawings, specifications, and on product literature in metric units. The preeminent role of soft conversion in construction has contributed greatly to the progress being achieved.

As of July 1993, GSA estimated the value of all federal metric projects in the planning, design, and actual construction phases at about \$12 billion. The GSA project manager said that GSA will meet the 1994 deadline for converting all its construction projects to the metric system. A number of other major agencies, according to the project manager, will probably complete their conversions for construction in 1995.

Another area of progress in metric construction involved DOE's Superconducting Supercollider (SSC), a high-energy physics facility located in Texas. DOE announced its plans to use the metric system in developing and procuring the SSC at a congressional hearing on conversion in April 1990. It described the SSC as the most significant example of its conversion program and stated that its technical components would be specified in metric units. It also stated that these components would cost several billion dollars and include virtually every capital acquisition for the program, with the exception of the underground tunnel and above-ground conventional support facilities.

The SSC was to be one of the largest metric procurements undertaken by the federal government. As stated in its April 1990 announcement, DOE planned to procure the technical systems in metric units while using nonmetric units in its conventional construction for the facility. The long-standing use of the metric system in high-energy physics largely accounted for DOE's plans for the SSC. DOE policy required the use of "hard" metric units in all SSC-related designs begun after March 1990.³

Federal Efforts to Address Metric Procurement Issues Face Many Problems

Despite these signs of success in a few important areas, federal progress in metric procurement remains limited. In addition, federal efforts to deal with issues relating to metric procurement face many problems.

Progress Remains Limited in the Procurement and Supply Subcommittee

GSA chairs the interagency Procurement and Supply Subcommittee. Although the subcommittee has met regularly, one of its primary efforts involving industry metric conferences has had only limited success. In addition, two of its members believe that the lack of involvement by DOD procurement officials has further weakened its efforts.

One key initiative of the subcommittee involved three industry conferences that focused on paints and coatings, "white goods" such as appliances, and electronic equipment. GSA took responsibility for the first two areas, DOD for the third. The subcommittee chairman said that GSA held both of its conferences in 1992 and that the results were discouraging. Neither the paints nor appliance industry expressed interest in providing metric products or converting to the metric system. DOD participated in a conference on electronics sponsored by the Electronics Industry Association in October 1992. DOD's metric coordinator said that the electronics industry was more receptive to exploring metric conversion than were the paints and appliance industries.

Members of the subcommittee also commented on a second problem. DOD's Metric Coordinator pointed out that no DOD procurement officials have been involved in the subcommittee's meetings. In spite of being a standardization official rather than a procurement expert, he has attended the meetings as the DOD representative because he felt that DOD should be involved, but he does not regard himself as the appropriate person. He noted that a representative from the procurement policy office planned to

³In October 1993, the Congress voted to terminate further work on the SSC.

attend one meeting but decided against it. In commenting on this situation, an official with the Office of Federal Procurement Policy (OFPP), also a member of the subcommittee, said that as long as no DOD procurement representative is involved, the effectiveness of the subcommittee will be greatly reduced.

Basic Problems Characterize Metric Procurement Policy

Progress in metric procurement policy is limited mainly to two revisions of the FAR and one proposed revision to OMB Circular A-119 dealing with voluntary standards. An OFPP official involved with metric issues told us that these three actions covered the most important areas in metric conversion policy.

The revision of FAR Part 7, "Acquisition Planning," occurred in December 1992, when DOD, GSA, and NASA issued a Federal Acquisition Circular. The Circular states only that the FAR is amended to encourage the use of the metric system in government procurements.⁴ FAR Part 10, "Specifications, Standards, and Other Purchase Descriptions," was revised in February 1992 with the addition of a reference to the metric system. The reference primarily summarizes the amendments. OMB Circular A-119, "Federal Participation in the Development and Use of Voluntary Standards," is being revised to include a metric reference. The proposed revision states that preference should be given, in light of stated national goals and objectives, to the adoption and use of voluntary standards that reflect the metric system. The revision does not include a definition of "preference" or discussion of its implementation.

In spite of these revisions to metric policy, several basic areas of concern remain to be addressed. These include (1) difficulties in implementing a workable definition of a "metric" product, (2) unresolved potential policy conflicts with other portions of the FAR and with the Competition in Contracting Act (CICA) in the current nonmetric environment, and (3) other issues relating to metric "preference" and the higher costs or premiums that may be associated with metric products.

The Chair, MOC, defined a metric product as a product that is described in metric units and that adheres to relevant metric standards and specifications. It is accepted internationally wherever metric regulations, codes, or standards prevail because it conforms to appropriate preferred

⁴An OFPP official noted that this approach omits any specific reference to the role of procurement officials and leaves the responsibility for metric conversion with "agency heads." He added that this approach reflects a view by procurement officials that they should not be involved in the process of metric conversion.

metric sizes. It is designed, manufactured, repaired, and recycled or disposed of using metric-dimensioned tools, processes, and specifications, wherever applicable.

However, the problems in implementing a workable definition of a metric product became evident during a discussion with FSS officials, who told us that they would have difficulty determining when a manufactured item actually becomes a metric item. For example, they pointed out that an item may have metric components but still not constitute a metric product. They also said that, even if they developed a definition of a metric product, they would not have the ability to "police" the manufacturers' catalogues and determine whether a declared metric item met the definition of a metric product. They believed that their suppliers would probably identify items as metric even if only a small part of the end products consisted of metric parts.

There are also potential policy conflicts between metric and other policy goals. The two main areas of concern involve FAR Part 11, "Acquisition and Distribution of Commercial Products," and FAR Part 25, "Foreign Acquisition." FAR Part 11 states that agencies shall acquire commercial products whenever these products adequately satisfy the government's needs. Thus, while the revision to FAR Parts 7 and 10 points toward a greater role for metric usage in federal procurement, FAR Part 11 instructs agencies to rely on the commercial marketplace. As we have seen earlier in this chapter, this policy has left agencies facing a predominantly nonmetric environment.

FAR Part 25 basically implements the Buy American Act by stating that only domestic end products should be acquired for public use with certain exceptions. Since metric products are more widely available from foreign suppliers than they are from domestic sources, agencies are concerned that an emphasis on metric procurement may lead to greater foreign involvement. The July 1993 interagency guidelines caution that insisting on a product made to metric specifications could give an unintended competitive advantage to foreign-owned firms. The guidelines recognize that, if prevailing international standards for a product are nonmetric or if a U.S. industry sector is predominantly nonmetric and cannot easily supply a product to metric specifications, this may constitute an exception to an agency's use of the metric system.

Another potential policy conflict involves the need for "full and open competition" as stated in the Competition in Contracting Act. GSA's metric

coordinator told us that GSA has a mandate to provide for full and open competition and that GSA cannot offer any requests for proposals restricted to metric products because the supplier base would be too limited.⁵

Other issues relating mainly to metric preference and potential premiums to be paid for metric products remain unresolved. The meaning of "preference" in practical terms for metric procurement is undefined. As one example, DOD's Metric Coordinator told us that he would like to receive guidance from DOD procurement experts about the meaning of metric preference but, as noted earlier, no discussions were underway.

The issue of potential premiums for metric products reveals basic inconsistencies in its interpretation by federal officials. After a June 1992 meeting of the ICMP, at which some officials expressed concern about increased costs due to conversion, the ICMP chairman stated in a letter to an agency official that the President recognized that there may be a cost to federal agencies. However, according to the chairman, the use of federal agency purchasing power to help U.S. industry to make the conversion is more important. The chairman also stated that no cost-benefit analysis at the individual agency or individual program level is needed. The chairman concluded that the GPO furnished a good example in working with the paper and printing industries to explore the use of standard metric paper sizes for federal correspondence and reports. The very example cited by the chairman, however, illustrates the opposite. As noted earlier in this chapter, GPO eventually cancelled its first major plans for printing with metric paper when its Request for Proposal met with a projected cost increase of over 30 percent. This case illustrates the problems arising from potential premiums for metric products.

In spite of these difficulties, however, we found no instance of an agency establishing guidelines to determine a reasonable or unreasonable premium. Partly in response to this problem, the interagency procurement guidelines noted that the Metric Conversion Act does not specifically authorize payment of direct additional costs for metric products.

⁵In its technical comments on our draft report, GSA noted that contracting personnel must be mindful of the requirement for full and open competition in procuring any services or supplies including those configured to metric measurements. It pointed out that the FAR defines full and open competition as the process by which all responsible offerors are allowed to compete. According to GSA, market research should reveal availability of products configured to metric measurement. When metric products are not available, soft metric, hybrid, or dual systems can be used in preparing the purchase description.

Guidance in Responding to Metric Procurement Issues Remains Incomplete

The problems facing metric procurement are complicated and have not been fully addressed. Until early 1993, various agency officials were frustrated with the virtual absence of guidance. For example, DOI's metric coordinator stated in December 1992 that, because there has been no coordinated guidance and direction on issuance of procurement instructions, the government is in a situation of needing hundreds of independent memos such as the ones generated by one of Interior's procurement offices.

In response to this situation, federal officials made two efforts in early 1993 to prepare overall guidance. However, one product, developed by the Procurement and Supply Subcommittee, was not circulated to other agencies because the MOC chair believed that further work was needed. A second product, developed primarily by the MOC chair, was circulated to key agencies and procurement officials for comment. The "Proposed Agency Guidance on the Use of the Metric System in Acquisitions" contained seven provisions relating to basic aspects of procurement.

DOD procurement officials stated that they took strong exception to this proposed guidance. They stated that the issue of how to implement the law and the Executive Order is totally within the purview of the technical community. Contracting personnel, according to a DOD memo, do not have the qualifications or specification knowledge to question whether an item should or should not be purchased using metric standards. The remainder of the memo then challenges four of the seven provisions. Thus, even recent efforts to resolve the issues relating to metric procurement produced further controversy and little agreement on how to achieve progress.

The response to these proposals by procurement officials also raised once more the question of their role in facilitating the conversion. As discussed earlier, DOD procurement officials have taken a "hands-off" approach. Nonetheless, other federal officials continue to believe that procurement officials need to be involved in converting federal procurement to the metric system. The law specifically refers to procurement and raises the expectation, among non-procurement officials, that help and guidance will be forthcoming from the procurement area. These conflicting points of view have not yet been resolved.

In a March 1993 meeting, the Procurement and Supply Subcommittee discussed ways of revising the proposals. They focused on the difficulties in defining an appropriate metric role for procurement officials. The

Subcommittee also agreed to establish special working groups to address a set of new objectives for its work provided by the chair of the MOC. These objectives included the development of model documents and statements that agencies can use for procurement-related activities and a strategic plan for government-wide procurement policies and regulations to improve implementation of the Executive Order. In our view, these objectives represent an important step, but federal officials have not yet had time to follow through with them.

In a June 1993 meeting of the ICMP, metric officials reviewed the guidelines further. The chair, MOC, emphasized at the meeting that these were only guidelines and were not mandatory. There was also discussion by the DOD representative about explicitly stating that agencies are expected to tailor the guidelines to their specific requirements. This statement was in fact incorporated into the final document that the ICMP approved in July 1993. The guidelines included such actions as the following: (1) All acquisitions that are measurement-sensitive should use the metric system of measurement to the maximum extent possible. (2) Specifications should identify measurement-sensitive deliverables, such as hardware, components, or documentation, and require that they use metric measurements. In our view, the guidelines represent a good first step in responding to the need for guidance but may not resolve all of the problems that we have identified.

Conclusions

A number of basic problems have limited the ability of agencies to achieve progress in metric procurement. The nonmetric environment, the lack of leverage provided by federal procurement in overcoming private sector resistance, and unresolved procurement issues are three of the most serious problems. DOD and NASA waivers indicate further procurement difficulties. Both agencies have granted waivers for several of their new acquisitions. However, they have begun exploring a subsystem approach to identify parts of a system that can be converted rather than waiving the entire system from metric requirements. We believe that this approach represents a useful compromise between the two extremes of total conversion or exemption and may be applicable in many situations. Such an approach is also consistent with the interagency procurement guidelines urging the use of the metric system to the maximum extent possible.

**Recommendation to
the Interagency
Committee on Metric
Policy**

As an alternative to exempting entire systems from metric requirements, we recommend that a subsystem approach to metric conversion be adopted where a total conversion is unfeasible. The Interagency Committee on Metric Policy, which is the committee responsible for guiding federal metric conversion, should establish this policy and make it known to its member agencies.

Federal Grants and Other Business Activities Show Mixed Progress Toward Metric Conversion

The Amendments to the Metric Conversion Act direct federal agencies, to the extent feasible, to use the metric system not only in their procurements but also in their grants and other business activities. The use of metric measurements in federal grants is extensive and shows a great deal of progress. For example, major grant-making agencies such as NSF and HHS' Public Health Service require their awardees to use the metric system in their grant proposals and reports on work conducted under federal grants.

The conversion of "other business-related activities" has advanced in some areas while encountering obstacles in others. Plans for the conversion of charts, for example, are actively underway. In other areas, however, federal agencies have met with resistance from the private sector or the public. Commerce affords a striking example in this regard. Even though Commerce, the lead agency for metric conversion, develops weather data using the metric system, it also "translates" the data back into the inch-pound system because of public resistance to metric units.

Grants for Research Are Metric, and Conversion May Be Required in Other Grants Activities

In general, federal grants for scientific research make extensive use of metric units. In other areas, such as federally funded highway construction, education, and housing, the question of federal leverage over grantees is being raised but in some cases has not been fully resolved.

Major federal agencies that award grants for scientific research have taken steps to include metric requirements. In an August 1990 application guide to grants for research and education in science and engineering, NSF stated that proposals for grants, cooperative agreements, and contracts submitted to NSF after January 1, 1991, are required to use the metric system. Likewise, the statement added, reports, publications, and communiques regarding proposals will be required to use metric units. HHS' Public Health Service, in an October 1991 "Grants Policy Statement," issued the same requirements and made them effective October 1, 1991. In an August 1992 Federal Register statement, EPA indicated that recipients of federal funds are encouraged to use the metric system. USDA's representative to the metric Subcommittee on Financial Assistance, which is responsible for addressing metric issues relating to federal grants, told us that metric units are used in all of the scientific and international areas relating to USDA grants. Similarly, a DOD member of the subcommittee told us that DOD grants for scientific research rely almost entirely on metric units. In general, the science-related activities funded by federal grants have converted to the metric system.

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In other areas such as highway construction, housing, and education, federal agencies and the MOC's Financial Assistance Subcommittee are addressing the role of federal leverage over grantees' activities. DOT has decided to include metric requirements for federally assisted highway construction. The metric coordinator in DOT's Federal Highway Administration (FHWA) discussed FHWA's Federal Aid Highway Program, which annually provides about \$18 billion in assistance to state agencies for highway construction. He said that, beginning September 30, 1996, state highway agencies receiving federal funds from the program will be required to use the metric system in the measurement-sensitive aspects of their plans for road construction. Measurement-sensitive areas include the depth of pavement, length of roadway, width of lanes, quantities of material used in construction, testing/sampling of materials, and other elements. The highways affected by DOT's decision belong to the National Highway System, which includes high-priority routes such as the Interstate Highway System, urban roads, major routes in the country, and bridges that total 155,000 miles at present.

Other agencies such as Education and HUD have not yet decided to include metric requirements affecting their grantees. An attorney with Education told us that these requirements might affect actions (such as procurements of metric goods) at the local level. These "flowdown" requirements, according to the attorney, need to be addressed on a government-wide basis through OMB Circular A-102, which deals with grants and cooperative agreements with state and local governments.

In this regard, the MOC's Subcommittee on Financial Assistance sent a memo to a task force involved in revising Circular A-102. The memo requested a revision that strengthens the language in this circular advocating the use of the metric system. In addition, the memo suggested that related language for A-102 should state that recipients and subrecipients of federal funds are encouraged to use the metric system. The A-102 Task Force received comments on the draft through November 1992 but as of July 1993 had taken no action based on the comments.

Members of the Subcommittee on Financial Assistance also discussed the issue of "flowdown" requirements at their December 1992 meeting. The chair said that the subcommittee was only beginning to explore the questions raised by the use of flowdown requirements in federal grants.

Other Business Activities Show a Mixture of Progress and Problems

"Other business-related activities" include an extremely broad range of federal efforts relating to metric conversion. Two findings emerged from our review of this area. First, in part because of the broad range of activities, progress is uneven, showing a mixture of successes and set-backs. This mixture shows up in almost every area; in the regulatory area, for example, one story may suggest progress while another suggests the opposite. Second, the problems are frequently related to resistance from the private sector or the public that are affected by these other activities. Federal agencies are often relying on the preferences of their "customers," thus limiting metric progress. This second finding tends to reinforce and extend what we found in chapter 3 regarding private sector resistance to metric procurement.

Progress Is Evident in Several Areas

The law does not specifically define what is meant by the term "other business activities."¹ In its October 1992 report to the President, however, Commerce briefly discussed a variety of these other activities. The discussion included publications and other documentation; private industry initiatives; federal employee training; and other business-related activities such as research and development, testing and measurement, and facilities and property management. It also included licensing and regulating; the collection, processing, and reporting of data; and state and local consultations in areas such as weather reporting.

Some of the most progressive areas identified in the Commerce report included publications and other documentation, private industry initiatives, federal employee training, and other activities such as research and development. In other areas such as regulatory conversion, agencies are facing greater opposition to change, but examples of progress can also be noted in these areas.

In publications and other documentation, the information submitted to Commerce furnished evidence of specific plans or progress toward metric conversion. DOI, for example, indicated that its goal is to express measurements in metric units exclusively or in dual dimensions, as appropriate, in all reports and publications. DOI noted that many of these reports and official publications are already published in metric units. Commerce's Coast and Geodetic Survey (C&GS) stated that it still retains most of its nautical charting processes and chart products in the inch-pound system but has an extensive program to change to metric units

¹The executive order provides that "other business-related activities" include all use of measurement units in agency programs and functions related to trade, industry, and commerce.

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in the shortest practical time. C&GS estimates that its inventory of approximately 1,000 charts will be published in metric units by about 2007.

Federal efforts to stimulate public awareness through publications range from NASA's poster, "Metric Is a Perfect 10," to GSA's popular brochure, "Metric: The System that Measures Up." Similarly, DOE announced an ambitious campaign through which its Energy Information Agency has included metric information flyers in its 75 publications with a total circulation of over 500,000 copies. Commerce has issued a variety of publications ranging from a metric style guide for the news media to a popular pamphlet, "Metric Measures Up," of which almost 67,000 copies were distributed in a 9-month period ending June 1993.

Many agencies have undertaken private industry initiatives. These include market surveys conducted by GSA, DOD, NASA, and others. They also encompass special efforts on behalf of small business through various agencies. In addition, agencies such as GSA, DOD, DOE, and others have identified training needs to facilitate conversion and have developed programs to meet them.

Certain regulatory agencies are also taking steps in a metric direction. FDA, for example, is focusing its metric activities on regulations relating to labels for a wide array of products. In response to technical amendments to the Fair Packaging and Labeling Act, which require dual (metric and inch-pound) labeling of net quantities, FDA is preparing a regulation that will affect the labeling of human and animal drugs, animal foods, cosmetics, biologics, and common medical devices such as thermometers. It published a May 1993 notice for this "umbrella" regulation in the Federal Register. In response to the Nutrition Labeling and Education Act, which also requires dual units relating to such items as fat content on food labels, FDA has published a January 1993 notice in the Federal Register. FDA is also revising all of its regulations, compliance guides, and other documents to reflect metric policy.²

As another example, DOT's National Highway Traffic Safety Administration has stated its plans to convert all of its measurement-sensitive activities to metric units. Even here, however, it noted certain exceptions. It will not convert its odometer fraud regulation to metric units because it lacks the authority to mandate that odometers maintain records in kilometers; in

²To update its Fair Packaging and Labeling Act regulation, the Federal Trade Commission also published an August 1993 Federal Register notice of proposed rulemaking.

addition, a conversion of the reading in miles to kilometers would result in what the report called massive confusion.

Problems Are Frequently Due to Private or Public Opposition

In our review of other business activities, we found that problems encountered by federal agencies frequently involved opposition from the private sector or the public. Generally speaking, the more directly a proposed conversion affects the private sector or the public, the greater the resistance.

This pattern is evident in such diverse areas as federal programs involving farmers, highway signs, food packaging and labeling, and weather reporting. In contrast to what was said above about the extensive conversion of USDA's scientific activities, its programs that more directly involve farmers are the target of a general USDA exemption from metric requirements. In September 1992, the Secretary of Agriculture stated in a letter to the Secretary of Commerce that he has granted a general exemption from metric conversion for projects or programs that directly affect individual farmers or farm programs. As noted in the letter, the Agricultural Stabilization and Conservation Service (ASCS) administers commodity stabilization programs designed to improve the economic stability of agriculture, to help farmers adjust production to meet demand, and to avoid severe price swings for farmers and consumers. Over 50 percent of farms normally participate, accounting for 80 to 85 percent of eligible acres. Because of the legal and technical requirements and property recording necessary to comply with these programs, conversion to the metric system of weights and measures, according to the letter, would severely disrupt the current ASCS operations.

One of the most visible and controversial areas of metric conversion involves the issue of converting highway signs. In early 1992, FHWA had originally intended to develop plans for such a conversion, but opposition expressed in certain newspapers led to a review of this decision. FHWA, in fact, received numerous inquiries about the proposed conversion, many of them raising concerns that the cost of conversion might be prohibitive. As a result, FHWA published an August 1993 Federal Register notice that offered several options for highway signs. Comments were due by November 1, 1993. FHWA is currently analyzing the responses.

Food packaging and labeling have also been a focus of controversy. Prior to the technical amendments that are now guiding FDA's work as described above, the Fair Packaging and Labeling Act would have required

manufacturers to use a "metric only" approach to labeling. Manufacturers opposed this approach for several reasons. They pointed out, for example, that in converting a quart to its metric equivalent, a fractional liter would be the result, creating the impression that consumers were receiving less for their money. In addition, they were concerned about the potential expenses of re-tooling equipment to produce "hard" metric-sized packages. They argued that a dual declaration of measurements on packages would be more reasonable. This suggestion led to the technical amendments that permit the use of dual units. The amendments also let manufacturers decide whether metric or inch-pound units will be the primary system on the package while the secondary system appears in parentheses.

Weather reporting provides another graphic example of difficulties faced by metric conversion. In this case, the National Weather Service (NWS) converts its metric data into nonmetric units because of public resistance to the metric system. In NOAA's metric transition plan, issued in September 1992, NWS comments that the metric system has been in use by NWS for decades. Almost all internal calculations are performed in the metric system. Many of the charts distributed daily to the professional community are now contoured in metric units. The report then notes that only the final displays are in the inch-pound system where direct transfer of information to users is required in inch-pound units. As part of its transition timetable, NWS formed a working group in fiscal year 1992 to consult with the Assistant Administrator of NWS on the advisability of specific changes from inch-pounds to metric units in NWS products.

In discussing NWS' efforts to promote metric conversion, NWS' Metric Coordinator told us that officials at his agency had contacted the Association of Weathercasters about the new federal policy. The Metric Coordinator said that the results of the contact were not encouraging. The Metric Coordinator said that the networks are highly competitive and are concerned about reduced viewer ratings if the weather data are provided in metric units. As a result, NWS has set no date for using metric units in weather information given to television and radio stations and does not expect a transition to occur in this area before the end of the century.

Among other things, the Commerce report to the President discusses private sector and public resistance to metric conversion. In particular, it contains an important observation about a tendency by federal agencies to rely on the preferences of their private sector and public "customers," thus limiting the degree of metric conversion in other business activities. The report expresses this view in several places, including its discussion of

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licensing and regulating, data-related activities, and state and local consultations.

In its discussion of licensing and regulating, for example, the report notes that agencies involved in these activities seem to be reluctant to encourage any change toward the use of the metric system. Typically, according to the report, these types of agencies take the view that their highest priority is to provide a service to their customers. Their customers—industry, consumers, and ordinary citizens—then dictate the measurement system. In every case, the report concludes, it is almost certain to be the existing system.

Some licensing and regulatory agencies, such as the Nuclear Regulatory Commission and Labor's Mine Safety and Health Administration, have stated their policy toward industry conversion as one of guidance rather than mandatory rulemaking. In response to a public comment on its metrication policy statement in the Federal Register, the Nuclear Regulatory Commission (NRC) opposed a suggestion to require all future licensing of new applicants to be in metric. For the NRC to require this type of action, the agency stated, it would need to show that the benefit of the action, such as the reduction of risk or improvement in administrative efficiency, would outweigh the costs. The NRC believes that the prevailing system of measurement is best determined by market forces and not by the NRC requiring the action.

The pattern of relying on customer preference identified by Commerce extends to the collection, processing, and reporting of data. According to the report, agencies that collect, analyze, and report data tend to perform these tasks using the units in which the data are initially provided to them. In most agencies, the report states, transition to the use of metric units will occur only when they determine that metric usage is preferred by the data providers and users.

Opposition to such change can be deep-seated. Two DOI agencies, the Minerals Management Service and the Bureau of Land Management, published a joint Federal Register RFI concerning the use of metric measurements in activities associated with drilling and producing oil and gas. Seventy-two of the 74 respondents (mostly oil and gas companies and associations) opposed conversion. According to DOI, record keeping in oil and gas is in inch-pound measurements, and tremendous costs are involved in changing computer routines to metric units. DOI stated that changing the existing production equipment for over a million wells would

be cost prohibitive if it were even possible. Mixing inch-pound and metric dimensions (even soft metric units), according to DOI, would create significant safety hazards.

Similarly, EPA stated in its 1992 report to the Secretary of Commerce that, in the view of some EPA officials, a portion of the audience outside EPA still prefers to see certain data presented in inch-pound units. If this perception is valid, the report continues, then conflict between wanting to communicate effectively and making a full transition to the metric system may remain until those "public" attitudes are addressed.

In federal consultations with state and local governments, the Commerce report noted a similar reliance on the preferences of the end user. The major areas of interaction include weights and measures, meteorology, safety and health, public works, education, and economics. The report states that, where the provision of information is uppermost, agencies tend to rely on user requirements to determine the form in which the information is provided, especially where public health and safety are involved.

Conclusions

The problems of achieving federal metric conversion in "other business-related activities" resemble those discussed earlier with regard to metric procurement. In addition, they raise the issue of continued public resistance to the metric system. To achieve greater progress toward conversion, however, the government must depend upon the support of the private sector and the public.

The government has been able to set a metric agenda and achieve conversion in only a few areas. The principal area is federal grants for research, in which the government controls the money and can set the conditions for its allocation. But even in the grants area for activities other than research, questions remain about "flowdown" requirements. In other business activities such as regulation, federal agencies have generally followed the preferences of their customers rather than imposing the metric system on them.

Because the government must make its decisions in the midst of a nonmetric environment, the pace and scope of the federal conversion effort has been limited and will remain so until the private sector and the public see a need for conversion. Federal leverage can exert only a modest pressure in this direction. Without greater non-federal support, the

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agencies will increasingly face the risk of discouragement in their conversion efforts, and the ultimate success of the conversion will be called into question. In general, the government cannot achieve conversion by becoming a metric island in a nonmetric nation.

Federal Agencies See a Need for Greater Nonfederal Cooperation

In dealing with private sector and public attitudes toward conversion, federal agencies see a need for greater nonfederal cooperation. This need is recognized in the Commerce Report to the President and in the comments of individual agencies. The original act also recognized the need for private and public participation through the establishment of the United States Metric Board, which was comprised of individuals representing various industry, professional, and state and local government groups. Although this Board has ceased its efforts, the amended act and the executive order provide authority for initiating efforts to achieve greater cooperation between the federal government, the private sector, and the public. We believe that the public and private sector need to be involved in conversion efforts with the federal government, if further metric progress is to occur.

Further Metric Progress Requires Greater Cooperation

The Commerce report to the President¹ recognizes the need for greater support from outside the government. As stated in the report, some federal agencies are skeptical about whether their actions will have a significant impact on the pace of the nation's progress toward use of the metric system. According to the report, they question whether reliance on federal procurements, grants, and other business-related activities will ever be fully effective. The report called for exploring additional measures involving other sectors of the nation. However, it provided no details for implementing this recommendation.

In addition to this general recommendation stated in the Commerce report, individual agencies have expressed the need for greater support. For example, in its report to the Secretary of Commerce, GSA stated that industry must be an active participant in the transition to the metric system. In many instances, according to GSA, federal agencies' ability to foster the conversion can reflect only what those in industry are willing and able to accomplish themselves. GSA added that all sectors of the economy must participate if conversion is to be successful.

In its report to the Secretary of Commerce, Justice also recognized the need for greater private sector involvement. It stated that realistic time frames need to be adopted simultaneously by industry and the government to plan effectively for the transition. It recommended that the federal government should consider establishment of federal advisory committees which would permit official private sector representation.

¹Annual Report to the President as Required by Executive Order 12770, Department of Commerce (Oct. 1992).

In its draft report on metric conversion for 1993, Commerce discussed the policies of two of its major agencies, Census and NOAA, with regard to the private sector. Census plans to move ahead selectively with conversion at industry's pace, while NOAA will seek to influence the pace of change. In both cases, however, Commerce recognizes that the actual response by industry to Census' and NOAA's approaches will control the pace of the metric transition.

In one of its waiver requests, NASA also provided an effective summary of the need for partnership in achieving conversion. According to NASA, one very important consideration in its metrification efforts is that it should neither lead nor lag domestic industry as a whole. NASA stated that the transition to the metric system is necessarily a "partnership" endeavor and will require all parties to proceed at roughly the same pace. If NASA were to be out of step, according to the waiver request, the entire process could prove to be more costly in the long term. In the cover memo accompanying the waiver document, NASA Associate Administrator for Safety and Mission Quality stated that the government cannot complete the transition to the metric system without industry support.

The Metric Conversion Act Provides a Framework for Greater Cooperation

The Metric Conversion Act of 1975 recognized the need for involvement by other sectors of the nation in the conversion process. In particular, it established and described the functions of the United States Metric Board. The Board was comprised of individuals from the private and public sectors. Although funding for the Board was discontinued in the early 1980s and its activities ceased, the structure of the Board provides a potential blueprint for federal efforts to achieve greater cooperation with the private sector and the public.

Under the act, the Board's membership was drawn from many sources, including engineers, scientists and technicians, the National Association of Manufacturers, the U.S. Chamber of Commerce, the American Federation of Labor and the Congress of Industrial Organizations, state and local governments, small business, the educational community, and consumers. The Board's functions included, but were not limited to, public information programs and consultations with the numerous groups already mentioned. The Board was authorized to establish such committees and advisory panels as it deemed necessary to work with the various sectors of the nation's economy and with federal and state governmental agencies in developing detailed conversion plans for those sectors.

In actual practice, the Board directed its activities toward (1) educating the public, (2) determining through research the impact of conversion on various segments of society, and (3) facilitating coordination of metric activities among the federal, state, and private sectors. In educating the public, the Board held a series of public forums, developed kits for students and teachers, and distributed radio and television public service programs. In its research activities, the Board completed 26 studies, including ones on statutory barriers and the effects of metrication on occupations, workers, and small businesses. In facilitating coordination, the Board established mechanisms for all sectors of the economy to share information on metric conversion.

In spite of these accomplishments, the original Metric Board established by the legislation suffered from two fundamental weaknesses. First, as noted in chapter 1, the Metric Conversion Act refrained from identifying the metric system as the preferred system of measurement. Consequently, the Metric Board was prohibited from advocating metrication but could assist various sectors of the nation when and if they chose to convert. Second, the Board included anti-metric as well as pro-metric members. According to a metric expert familiar with its operations, the Board members themselves, who represented a variety of constituencies, had differences of opinion about the desirability of metric conversion and their role in carrying out the mandate. In part because of these weaknesses, funding for the Board was discontinued in 1982, and its activities ceased.

In discussing the legislation and the Metric Board with agency metric officials, we found a great deal of reluctance on their part to revive the Metric Board. In particular, the chair of the MOC told us that he would not want to reconstitute the Board because of its previous weaknesses and its aura of failure. However, he believes that the legislation provides both the necessary authority and a useful plan for greater cooperation between the federal government, the private sector, and the public. He said that its authority would permit the development of advisory committees that could help to strengthen federal conversion activities.

As stated above, the amendments to the act declared the metric system the preferred system of weights and measures for U.S. trade and commerce and recognized the need to provide education and guidance to the public. To this end, the executive order designated Commerce to direct and coordinate the federal effort to implement the metric policy. It also authorized Commerce to form advisory committees (representing, among

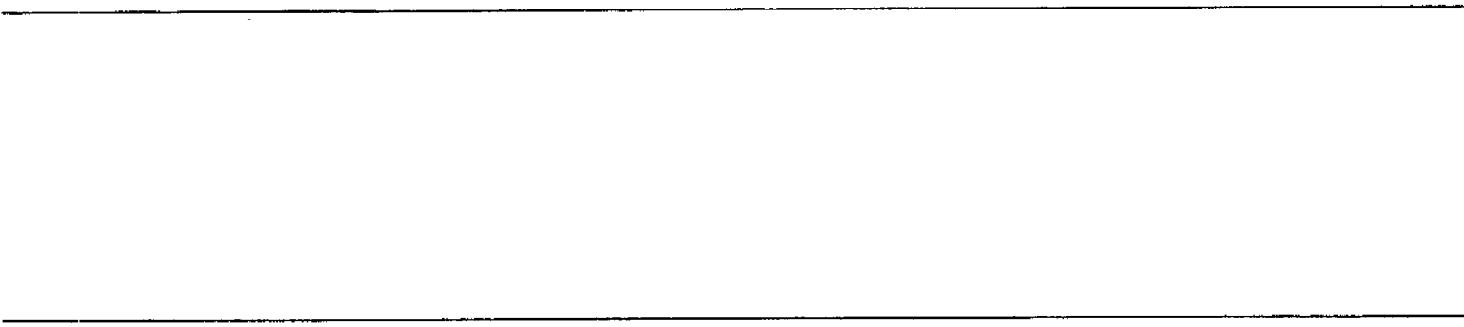
others, state and local governments and the business community) when necessary to achieve this goal.

Conclusions

In responding to private sector and public concerns about conversion, Commerce's Report to the President and comments from individual agencies support the view that progress can best be achieved through greater cooperation between the federal government, the private sector, and the public. The Metric Conversion Act and the executive order provide the authority for such a cooperative effort. Although federal metric officials have recently recognized the need to seek greater involvement by the private sector and the public, they have not yet prepared a detailed plan for doing so.

Recommendation to the Secretary of Commerce

Now that most agencies have made significant progress in preparing for metric conversion, GAO recommends that the Secretary of Commerce explore ways for bringing together the government, the private sector, and the public to discuss the next steps in decision-making about metric conversion. To assist in this effort, the Secretary should prepare and implement a detailed plan for encouraging this broader national dialogue.



Comments From the Department of Commerce

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



NIST

UNITED STATES DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
Gaithersburg, Maryland 20899
OFFICE OF THE DIRECTOR

SEP 28 1993

Mr. Victor S. Rezendes
Director, Energy and Sciences Issues
U.S. General Accounting Office
Washington, DC 20548

Dear Mr. Rezendes:

Thank you for your letter requesting the Department's comments on the draft General Accounting Office (GAO) report entitled "Metric Conversion: Future Progress Depends upon Private Sector and Public Support" (GAO/RCED-93-181).

The report focuses on the priorities in the Federal metric transition, addresses the important issues, particularly procurement and education, and identifies strengths and weaknesses in the Federal agencies' metric transition activities. However, the report lacks a substantive review of the causes and remedies for the problems it uncovers. We recommend that, in addition to describing the actions and views of the agency officials interviewed, GAO strengthen the report by including a critical evaluation of those actions and views, as well as an assessment of their consistency with the requirements of both the Metric Conversion Act, as amended, and Executive Order 12770. Furthermore, the report fails to connect the problems it uncovers to specific recommendations for either the Federal agencies, the Administration, or the Congress. The Federal agencies need help in their metric transition efforts, as discussed in the report.

The GAO report could help the Federal agencies by recommending appropriate measures to overcome the problems and impediments identified in the report. In particular, Sec. 12(b) of the Metric Conversion Act, as amended, gives the GAO opportunity to make legislative recommendations to Congress on these matters. We recommend that if the GAO has no legislative recommendations, the report should so state. This is the only legislatively required report by the GAO on the implementation of the Metric Conversion Act. For these reasons, we request a meeting with GAO representatives to resolve the issues identified in this letter and in the enclosed list of comments on specific statements in the report.

The following comments apply to the two recommendations in the report. The recommendation that the Secretary of Commerce prepare a plan for bringing together the government, the private sector, and the public to discuss the next steps in metric conversion and for encouraging a broader national dialogue does not, in our opinion, go far enough toward solving the problems

See comment 1.

See comment 2.
See comment 3.

See comment 4.

See comment 5.

See comment 6.

Appendix I
Comments From the Department of
Commerce

identified in this report. Such a plan already exists in Sec. 6 of the Metric Conversion Act as amended. It is our view that the important next step is the implementation of a plan that already exists in current law rather than the development of any new plan.

See comment 7.

See comment 8.

See comment 9.

See comment 10.

See comment 11.

The recommendation that the Interagency Council on Metric Policy (ICMP) support a subsystem approach to metric conversion where a total conversion is unfeasible addresses only one of the procurement issues that are discussed in the report and may do more harm than good because it makes one type of solution appear better than a broader, more flexible approach. In addition, it does not solve the more critical problem of procurement officials being reluctant to work actively with industry to implement metric usage. The interagency guidance that was approved by the Metrication Operating Committee (MOC) and ICMP on the use of the metric system in acquisitions (discussed in the last section of chapter 3) is preferable to this recommendation. This guidance already addresses the use of the metric system for components. It contains different approaches to conversion which may be appropriate in different situations, including procuring non-metric products when necessary but using the equivalent metric units to describe the products (with the non-metric units in parentheses, if desired). We urge the GAO (1) to recommend that Federal agencies adopt and implement the procedures in the interagency guidelines, (2) to consider whether changes to the Federal Acquisition Regulations are appropriate, (3) to consider whether any actions should be requested of the Office of Management and Budget based upon our comments in the enclosure, and (4) to explore whether additional legislation may be necessary.

We have enclosed a list of comments on specific statements in the report. We appreciate the opportunity to comment on this report.

Sincerely,



Arati Prabhakar
Director

Enclosure

The following are GAO's comments on the Department of Commerce's letter dated September 28, 1993.

GAO Comments

1. We believe that the report provides a substantive review of the causes for the problems it identifies and makes appropriate recommendations to address these problems. As discussed in the Executive Summary and amplified throughout the report, many of the difficulties facing federal agencies are caused by a procurement environment in which most products are nonmetric and in which federal agencies represent too small a share of the total market to stimulate private sector conversion. In our view, Commerce has underestimated the importance of barriers and limitations that are identified in chapters 3 and 4 and that are basically beyond the control of federal agencies. We continue to believe that greater support from the private sector and the public is essential to metric progress.
2. Rather than presenting a "critical evaluation" of agency officials' views and activities, we sought to provide a balanced evaluation, noting areas of progress as well as problems. Specifically, we have distinguished between problems resulting from federal agency practices and problems resulting from private sector or public reactions to metrication. We also discussed situations in which federal agencies have attempted to push conversion and then met with external resistance. In these cases, we believe that federal agencies deserve recognition for their effort.
3. Commerce calls for GAO to assess federal actions and views for consistency with the Metric Conversion Act and the Executive Order. In this connection, we discussed the use of broad waivers from metric requirements and made a recommendation addressing this problem.
4. Commerce states that the report fails to connect the problems it uncovers to specific recommendations. We disagree. We provided a specific recommendation to deal with the problem of broad waivers for large procurements. We also provided a more general recommendation to address the need for greater cooperation between federal agencies, the private sector, and the public.
5. We found no evidence that would support the need for legislative recommendations. As noted in our report, the Metric Conversion Act provides the necessary authority for seeking greater cooperation between the federal government, the private sector, and the public.

6. We agree that implementation of a detailed plan is crucial. As we stated in the report, however, federal officials have not yet prepared such a plan to achieve this objective. We do not believe that Commerce can implement the law adequately without a great deal of further planning and preparation.

7. Commerce stated that this recommendation may do more harm than good because it makes one type of solution appear better than a broader, more flexible approach. In this case, we provided a specific recommendation to address a problem of major importance. When Commerce states that the recommendation addresses "only one" procurement issue, this comment needs to be put in perspective. The use of comprehensive waivers for exempting entire systems from metric requirements involves major procurements. For example, DOD's attempt to waive a single weapon system, discussed in the report, was focused on a system that is the planned replacement for 41 amphibious warships. We considered it appropriate to draw attention to this problem and to make a specific recommendation concerning it.

8. Commerce states that the recommendation does not address the reluctance of procurement officials to work with industry in implementing metric usage. The report discusses the uncertainties surrounding the role of procurement officials and the difference of opinion in this matter between procurement and metric officials. We met with officials representing both points of view and noted the lack of agreement between the two sides.

9. We believe that the interagency procurement guidelines will be useful and that our recommendation on the need for a subsystem approach also makes a positive contribution to the objective of metrication.

10. We considered these issues in preparing our report and decided that additional recommendations would not be appropriate.

11. In a separate addendum, Commerce provided technical comments that we have incorporated where appropriate.

Comments From the General Services Administration

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



Administrator
General Services Administration
Washington, DC 20405

September 24, 1993

Mr. Victor S. Rezendes
Director, Energy and Science Issues
General Accounting Office
Washington, DC 20548

Dear Mr. Rezendes:

Thank you for affording the General Services Administration (GSA) an opportunity to review the draft General Accounting Office (GAO) report entitled "Metric Conversion: Future Progress Depends Upon Private Sector and Public Support."

The draft report examines Federal agencies' implementation of the Metric Conversion Act. The report found that since 1990, Federal preparations for metric conversion have advanced dramatically. Although most Federal agencies have made extensive preparations for metric conversion, they are still facing serious difficulties in putting their plans into practice. These difficulties include, among other things, a procurement environment in which most products are nonmetric and in which Federal agencies represent too small a share of the market to stimulate private sector conversion. The report concludes that the Federal Government by itself cannot achieve the goal of metric conversion. It must depend upon support from its private sector suppliers and from the public, if the conversion is to be successful. The report recommends that the Secretary of Commerce explore ways for bringing together the Government, the private sector, and the public to discuss the next steps in decisionmaking about metric conversion.

While GSA recognizes the potential disadvantages for the United States in operating under a non-standard measuring system, we are also cognizant of the apparent lack of commitment and support on the part of industry and the public. Accordingly, before additional resources are consumed in preparing Federal business activities for metric conversion, we recommend a complete reassessment of the viability of the statutory requirement. We question whether the indirect use of Federal activities to foster change by industry represents the best utilization of our resources in these times of streamlining, downsizing and making Government more responsive and cost-effective.

See comment 1.

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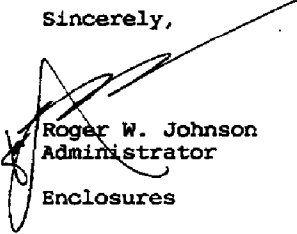
**Appendix II
Comments From the General Services
Administration**

-2-

See comment 2.

I appreciate the time and effort expended by GAO officials in developing the draft audit. Enclosed are additional comments prepared by GSA staff.

Sincerely,


Roger W. Johnson
Administrator

Enclosures

**Appendix II
Comments From the General Services
Administration**

The following are GAO's comments on the General Services Administration's letter dated September 24, 1993.

GAO Comments

1. We do not believe that a reassessment of the viability of the statutory requirement is appropriate at this time. Federal agencies have made progress in preparing for conversion. Their efforts now stand in need of greater support from the private sector and the public. The development of a plan by Commerce remains necessary to bring together the government, the private sector, and the public if further progress is to be achieved.
2. In a separate addendum, GSA provided technical comments that we have incorporated where appropriate.

Comments From the Department of Education

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



UNITED STATES DEPARTMENT OF EDUCATION
OFFICE OF ELEMENTARY AND SECONDARY EDUCATION

OCT 13 1993

Mr. Victor S. Rezendes
Director, Energy and Science Issues
Resources, Community, and Economic
Development Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Rezendes:

The Secretary has asked me to respond to your request for comments on the General Accounting Office (GAO) draft report titled, Metric Conversions: Future Progress Depends upon Private Sector and Public Support (GAO/RCED-93-181) which was transmitted to the Department of Education by your letter of August 27, 1993. As the Assistant Secretary for Elementary and Secondary Education, I am the Department's senior metric official. The draft report reflects the substance of several discussions between the GAO and Mr. Theodore Parker of my staff.

The draft report states that the Department of Education has a key role to play in fostering metric education. The Department fully supports conversion to the metric system of measurement. But the role of the Department with regard to fostering metric education is limited by its organizational statute. Section 103 B of the Department of Education Organization Act (20 U.S.C; Section 3403 B), prohibits the Department from prescribing or mandating any area of curriculum.

The draft report commented that the Department's acquisition regulations, which focused on contract-related activities, failed to refer to metric conversion in the broader areas of national educational policy. The intent of the regulations was to provide notice to the Department's customers and vendors that RFP responses that included metric measurement would be accepted and encouraged. Since the focus of the regulations concerned procurement guidance, any reference to a potential role of metric in the broader areas of national education policy would have been inappropriate. As for grants, OMB Circular A-102 must be revised to reflect a government-wide metric conversion policy.

400 MARYLAND AVE., S.W. WASHINGTON, D.C. 20202

Our mission is to ensure equal access to education and to promote educational excellence throughout the Nation.

See comment 1.

See comment 2.

Appendix III
Comments From the Department of
Education

Page 2

As you note, the Department has made significant efforts in support of metric conversion since the GAO's last report three years ago. Since then the Department's accomplishments include:

- o Preparation of annual reports of progress to the Congress for 1990, 1991 and 1992.
- o Leadership of the Interagency Subcommittee on Education and Public Awareness which meets regularly on a bi-monthly basis.
- o Preparation of a Metric Acquisition Regulation that was published in the Federal Register in May 1993.
- o Preparation of a departmental metric transition plan.
- o Participation on the Interagency Council on Metric Policy (ICMP), the Metrication Operating Committee (MOC) and various MOC subcommittees.

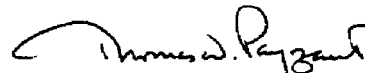
See comment 3.

As an interagency subcommittee of the Metrication Operating Committee (MOC), the Public Education and Awareness Subcommittee has met bi-monthly to explore activities that could enhance the awareness of employees and the public about metric conversion. The agency representatives generally lack the time, authority or resources for implementing the ambitious plans envisioned by the Department of Commerce and the U.S. Metric Association. Despite these limitations, the subcommittee is exploring the development of a public affairs policy guide on the use of metric in press releases and other communications.

See comment 4.

The Department recognizes that much remains to be done, including determining whether and how metric conversion could benefit from implementation of the GOALS 2000 legislation, revisiting the transition plan and considering a metric conversion policy for grants. Should you have additional questions about the Department's activities regarding metric, please feel free to contact me or Mr. Theodore Parker.

Sincerely,



Thomas W. Payzant
Assistant Secretary

The following are GAO's comments on the Department of Education's letter dated October 13, 1993.

GAO Comments

1. We have noted the Department's view that it cannot prescribe or mandate metric education as part of the curriculum. We focused on the lack of progress in areas where the Department could make an important contribution to metric conversion. One of these areas concerns the potential inclusion of metric education among the Department's national goals for education.
2. Our report recognized the specific purpose of the Department's acquisition regulations. We did not intend to imply that the regulations "failed" to refer to metric conversion in the broader areas of national educational policy nor did we suggest that the regulations were the appropriate place in which to address this issue. To avoid confusion, we have deleted the reference to broader areas of national education policy in this context.
3. As of November 1993, this transition plan has not been finalized.
4. Education refers to the lack of time, authority, or resources for implementing a more ambitious plan. The Metric Conversion Act clearly provides a great deal of authority. It specifically refers to the federal policy of seeking out ways to increase understanding of the metric system of measurement through educational information and guidance and in government publications. The executive order states that the head of each executive department and agency shall be responsible for implementing and applying the necessary resources to accomplish the goals set forth in the Metric Conversion Act and the executive order. In our view, the development of the policy guide to which Education refers may be only a first step toward responding to the goals of the act.

Comments From the Department of Defense

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



ACQUISITION

OFFICE OF THE UNDER SECRETARY OF DEFENSE

WASHINGTON, DC 20301-3000

NOV 01 1993

DP/DSPS

Mr. Victor S. Rezendes
Director, Energy and Science Issues
Resources, Community, and Economic
Development Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Rezendes:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report, "METRIC CONVERSION: Future Progress Depends Upon Private Sector and Public Support," dated August 27, 1993 (GAO Code 307705/OSD Case 9478).

We find the report to be factual. We would, however, like to clarify the issue of organizational responsibility for metric conversion within the DoD.

The procurement community will implement in the Federal Acquisition Regulation or the Defense Federal Acquisition Regulation Supplement appropriate policy that applies to the contracting process. Metrication experts must determine availability of metric products, costs of conversion to metric, and development of commercial type specifications.

It is not appropriate for procurement officials to determine technical requirements on a particular program. Suggestions that procurement personnel should lead the metric conversion effort would be an abandonment of responsibility by metric program experts. Procurement personnel are not responsible for specification requirements, nor is it appropriate that they should be.

The Department appreciates the opportunity to review the report in draft form.

Sincerely,

A handwritten signature in cursive script that reads "Eleanor R. Spector".

Eleanor R. Spector
Director, Defense Procurement

See comment 1.

The following is GAO's comment on the Department of Defense's letter dated November 1, 1993.

GAO Comment

1. DOD reiterates the view that we discussed in our report. However, as we noted in chapter 3, federal metric officials continue to believe that procurement officials need to be involved in converting federal procurement to the metric system. These conflicting points of view have not yet been resolved.

Major Contributors to This Report

Resources,
Community, and
Economic
Development
Division, Washington,
D.C.

Jim Wells, Associate Director
Robert E. Allen, Jr., Assistant Director
Dennis Carroll, Evaluator

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