

GAO

Report to the Chairman, Committee on
Science, Space, and Technology, House
of Representatives

March 1990

METRIC CONVERSION

Plans, Progress, and Problems in the Federal Government





United States
General Accounting Office
Washington, D.C. 20548

**Resources, Community, and
Economic Development Division**

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March 30, 1990

The Honorable Robert A. Roe
Chairman, Committee on Science,
Space, and Technology
House of Representatives

Dear Mr. Chairman:

In response to your letter dated July 18, 1989, this report discusses the plans, progress, and problems associated with metric conversion in the federal government. A total of 37 agencies were included in our review. The report contains recommendations to the Secretary of Commerce and matters for consideration by the Congress.

As arranged with your office, unless you publicly release its contents earlier, we plan no further distribution of this report until 30 days after the date of this letter. At that time, we will send copies to the Secretary of Commerce, the members of the Interagency Committee on Metric Policy and the Metrication Operating Committee, and to other interested parties upon request.

This work was prepared under the direction of John M. Ols, Jr., Director in the Resources, Community, and Economic Development Division (202) 275-5525. Other major contributors to this report are listed in appendix IV.

Sincerely yours,

A handwritten signature in cursive script that reads 'J. Dexter Peach'.

J. Dexter Peach
Assistant Comptroller General

agency has not demonstrated a commitment to guiding the conversion. As with other agencies, Commerce's allocation of resources to support the effort has been minimal, and officials at major agencies including DOD, GSA, and NASA have said its lack of commitment has weakened their own efforts.

Agencies have not advanced beyond the early stages of planning. Only 6 agencies among the 37 that GAO surveyed have completed their guidelines. Only one has developed a transition plan. None has developed time frames indicating the extent of metric conversion each plans to accomplish by the end of fiscal year 1992. There is a need to improve the content and timeliness of agency guidelines and establish time frames for measuring progress.

Some activities are underway to promote metric conversion, but progress is limited. The great majority of the agencies stated that more than three-quarters of total work for metric conversion remains to be done. Various metric committees have been established, and agencies have identified a variety of other initiatives underway to a limited extent.

Problems relating to conversion, however, call into question the federal agencies' commitment to the transition. Staff resources assigned by government agencies to support the effort are minimal. Nine of 10 important interagency subcommittees have not convened. Some agencies, including GSA and DOD, view the lack of metrication in some areas of the private sector, such as construction, as an obstacle.

Principal Findings

Limited Planning for Metric Conversion

Metric conversion guidelines required by the legislation are important, but only six agencies reported that they had completed them by February 1990. Although the Congress suggested that agencies model their guidelines on a DOD Directive containing agency policy, responsibilities, and reporting requirements for metric conversion, three of the six completed guidelines do not conform to this model. Sixteen more agencies expect to prepare their guidelines in 1990. An additional 12 agencies did not identify a date when they would complete their guidelines, and 3 more did not expect to finish them until 1991 or 1992.

Coordinating the conversion is a formidable task in view of the large number of agencies and issues. Thus, leadership from Commerce and the role of committees become paramount concerns. Efforts to appoint an Under Secretary of Commerce for Technology, who is expected— together with other duties—to provide high-level coordination for this transition, are underway; Commerce hopes to fill the position in 1990. A further difficulty involves the interagency MOC subcommittees. Nine of the 10 subcommittees that cover key transition activities and are considered crucial to the conversion have not convened due to problems such as vacancies and uncertainty about who is to appoint members.

Other issues, such as the long-standing problem of coordination with and conversion of the private sector to the metric system, the review of specifications and standards, costs associated with conversion, and metric education, pose additional problems to various agencies.

Recommendations to the Secretary of Commerce

GAO recommends that the Secretary of Commerce, as head of the lead agency in guiding the federal metric transition, take steps to respond to the problems identified above. These steps should include efforts to develop guidelines along with specific time frames and a realistic estimate of resources needed to support metric conversion, as well as efforts to encourage the effective use of interagency subcommittees as soon as possible.

Matters for Consideration by the Congress

Given the problems that GAO identified and especially the low level of resources that agencies have made available to support metric conversion, the Congress may wish to require that agencies (1) follow guidance provided by Commerce as the lead agency and (2) include in their annual reports to the Congress a realistic estimate of the resources needed and the time frame required to achieve metric conversion.

Agency Comments

At the request of the committee, GAO did not obtain comments on a draft of this report.

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Abbreviations

CIA	Central Intelligence Agency
DOD	Department of Defense
EPA	Environmental Protection Agency
FCC	Federal Communications Commission
GAO	General Accounting Office
GPO	Government Printing Office
GSA	General Services Administration
HHS	Department of Health and Human Services
HUD	Department of Housing and Urban Development
ICMP	Interagency Committee on Metric Policy
MOC	Metriation Operating Committee
NASA	National Aeronautics and Space Administration
NRC	Nuclear Regulatory Commission
OPM	Office of Personnel Management
SBA	Small Business Administration
TVA	Tennessee Valley Authority
VA	Department of Veterans Affairs

support of voluntary metrication.” The letter also referred to the Secretary of Commerce’s “enhanced responsibilities” but did not define them in further detail.

Commerce’s Under Secretary for Technology¹ chairs the Interagency Committee on Metric Policy (ICMP), which coordinates and provides policy guidance on metrication to the heads of all federal agencies. The ICMP is composed of representatives at the assistant secretary level from major federal departments and agencies. In addition, a 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. Within Commerce, the Office of Metric Programs with its two professional staff conducts policy analyses and furnishes support for carrying out the Department’s activities through the ICMP/MOC.

At the time of our review, 37 federal agencies were members of the ICMP and MOC; they are listed in appendix I. Along with Commerce, the two other most important agencies in the transition are the GSA and DOD. Because GSA has many responsibilities as the government’s “business manager,” it is incumbent on GSA to take a leadership role in metric transition. Similarly, DOD’s efforts to implement the conversion are significant due to the scope of its procurement activities. As one example of its important role, DOD’s conversion guidelines were cited by the conference committee report on the amendments as the model to be followed by other federal agencies.

Although Commerce, GSA, and DOD are the principal agencies in the transition effort, other agencies are faced with important metric-related issues. To take only two examples, NASA has repeatedly studied its procurement of the multi-billion dollar space station, and NRC is reviewing many of its activities for purposes of metrication.

Metric conversion will require a great amount of work. Initial efforts, for example, involve the preparation of agency guidelines and transition plans as well as the development of schedules used to measure progress. (See chapter 2.) Further activities include the formation of metric committees and specific actions such as the identification of measurement-sensitive concerns. (Measurement-sensitive concerns can include federal laws, regulations, specifications and standards, or other concerns that

¹This position has not been filled since its creation in January 1988. See chapter 3 for further discussion.

Objectives, Scope, and Methodology

The House Committee on Science, Space, and Technology, in a letter dated July 18, 1989, asked us to conduct a review of federal metric conversion activities. Based on a briefing to the Committee on December 11, 1989, we agreed to focus our report on three general issues: plans, progress, and problems in the federal metric conversion.

Our report focuses primarily on the status of federal efforts and only secondarily on the technical problems associated with the transition. Since most federal activities are still at a very early planning stage, we did not attempt to discuss or resolve the much more technical problems involved in the transition. Consequently, our recommendations emphasize procedural matters to lay the groundwork for dealing with the technical issues.

We based our work primarily on a survey of 37 federal agencies. (See appendix I for a list of the agencies included in the survey.) We concentrated on these agencies because they comprised the membership of the ICMP/MOC at the time of our review. Thirty-six of the 37 agencies responded to the survey.² We tabulated the data in the 36 questionnaires. Some agencies also provided additional insight into their concerns about the metric conversion. This information is contained in appendix III.

We also talked with officials at the Department of Education, the National Science Foundation, the Small Business Administration (SBA), the Department of Labor, GSA, and DOD regarding their agencies' metric education activities.

We performed our audit work in Washington, D.C., between August and December 1989. Our work was conducted in accordance with generally accepted government auditing standards. As requested by the Committee, we did not obtain agency comments on this report.

²The Export-Import Bank did not respond. Their ICMP representative told us in December 1989 that the Agency had not yet begun to address the metric conversion issue.

- Late 1989: GSA,¹
- 1990: Department of Agriculture, Department of Commerce, Department of the Interior, Department of Health and Human Services (HHS), Department of Housing and Urban Development (HUD), Department of Justice, Department of the Treasury, Central Intelligence Agency (CIA), Environmental Protection Agency (EPA), NASA, National Science Foundation, NRC, Office of Personnel Management (OPM), Smithsonian Institution, United States Postal Service,
- 1991: Department of State, Consumer Product Safety Commission,
- 1992: Department of Energy,² Federal Emergency Management Agency;
- Twelve agencies not stating when guidelines will be completed: Department of Education, Department of Labor, Department of Transportation, Commodity Futures Trading Commission, Export-Import Bank, Federal Maritime Commission, Federal Reserve Board, Federal Trade Commission, Interstate Commerce Commission, Office of the United States Trade Representative, Tennessee Valley Authority (TVA), United States International Trade Commission.

Content and Timeliness of Guidelines

The Conference Committee Report on the Omnibus Trade and Competitiveness Act that amended the original Metric Conversion Act suggests a model for agencies developing metric conversion guidelines: "Each agency is expected to establish guidelines similar to DOD Directive Number 4120.18, dated September 16, 1987, as soon as possible following the date of enactment." To emphasize the importance of DOD's guidelines as a model, the report discussed the Department's guidelines in detail. In particular, the Directive provides a clear outline of agency policy, responsibilities, and reporting requirements. However, in reviewing the guidelines completed by the agencies, we found that only GPO's and GSA's guidelines conform with this model.

The other three finished guidelines did not follow the model. Although VA's guidelines contain some degree of detail and include agency policy and responsibilities, their guidelines are merely a collection of three memos issued in 1976, 1977, and 1980. The 1977 memo indicates that it was to be rescinded in May 1979. FCC's and SBA's guidelines are about a page in length, provide no detailed guidance, and in our opinion will not be sufficient to direct agency actions in subsequent metric conversion

¹GSA's guidelines were actually completed in February 1990.

²In December 1989, subsequent to our receipt of our questionnaire, Energy revised its expected date for completing its guidelines. It now plans to finish them in early 1990.

options for one-step, gradual, and partial conversion. The committee found that immediate (one-step) conversion of NRC activities to metric units is impractical. In general, for its various activities, NRC found gradual conversion extending through 1997 to be more appropriate.

Transition plans in other agencies have not been formalized on an agency-wide basis, although some efforts are underway. For example, NASA has developed a planning document and has funded a contractor study regarding metric issues affecting the space station. GPO does not expect to complete its transition plan until October 1990. In general, the transition plans of DOD and GSA and the report by NRC are the only agency-wide documents that we were able to identify.

Absence of Time Frames for Metric Conversion

The Metric Conversion Act, as amended, states that each federal agency by a date certain and to the extent economically feasible by the end of fiscal year 1992 should use the metric system. Thus, the establishment of intermediate time frames or milestone dates for achieving this objective is very important. In this regard, we found a general absence in all agencies of time frames or milestones by which to measure such progress.

None of the six agencies with completed guidelines as of February 1990 provided specific time frames indicating metric conversion by the end of fiscal year 1992. DOD has scheduled some of its activities for conversion, but it has not yet determined a date for completing the transition. (The DOD Metric Transition Plan requires that time frames be recommended by July 1991.) VA and GSA provided no time frames. GPO stated only that it would implement conversion in a manner consistent with the law but also provided no time frames. SBA provided benchmarks in a few areas extending through 1993. The FCC indicated that it has completed its guidelines and its transition to the metric system; having given this assessment of its status, it provided no further time frames.

Two other agencies—Energy and NRC—indicated that they will not be able to complete their work by 1992. NRC anticipates a time frame extending through 1997 for metric conversion. The remaining agencies did not provide time frames for their conversion activities.

Progress Toward Metric Conversion Has Been Limited

In addition to specific planning activities mentioned in chapter 2, agencies have initiated a variety of activities to promote metric conversion, but overall progress is limited. Only about a third of the agencies included in our survey have taken steps to inform key officials in their agencies of the amendments to the Metric Conversion Act. Ten agencies have established internal metric committees, but four of these committees have been inactive or were formed only recently. Although we identified specific areas of metric-related activity (such as the inclusion of metric language in procurement, grants, and other business-related activities) the extent of activity in these areas is limited. Even DOD, which is playing a major role, acknowledged that it has performed activities essential to the transition to only a limited extent. Twenty-seven agencies indicated that 75 percent or more of total work for metric conversion remains to be done.

Progress as a Function of Commitment

One of the most essential ingredients for metric conversion, according to Commerce's Director, Office of Metric Programs, is the commitment of the federal agencies. He told us that the agencies making the most progress have found at least one person, generally a senior official, to support the conversion effort. He also emphasized that without this active support by at least one senior official, the progress of an agency's entire metric conversion effort may be called into question.

As a further illustration of this point, Congressman George Brown, the sponsor of the amendments to the Metric Conversion Act in the House Committee on Science, Space, and Technology, directed his remarks specifically to the Department of Commerce at a meeting of ICMP officials in October 1989. He recommended that Commerce's Under Secretary for Technology be formally designated as the spokesperson and coordinator in the federal government for metric conversion. He underscored his recommendation with the following point: "It is extremely important that a high-level official be seen as taking charge in coordinating and providing policy guidance for the federal government's transition to the use of the metric system and to assist in the resolution of any metric-related problems."

As noted previously, the position of Under Secretary for Technology has remained vacant since its creation in January 1988. The absence of the senior official formally assigned to chair the ICMP and oversee the federal metric transition since the passage of the amendments in 1988 has added to Commerce's difficulties in guiding the conversion effort. The vacancy, according to Commerce's Director, Office of Metric Programs,

Formation of Metric Committees and Their Activities

In an effort to facilitate the transition, numerous metric committees have been or are being formed. These committees, which range from the top-level ICMP to internal agency committees used for coordination and agency task forces used for studying specific areas such as procurement or training, target a wide range of key issues and have a critical role to play. The formation of internal metric committees in many of the key agencies is a very positive sign. In general, however, the progress resulting from the various committees has been somewhat limited.

ICMP and MOC

As described in chapter 1, these two committees are responsible for coordinating government-wide transition efforts. Subsequent to the passage of the Metric Conversion Act, as amended, the ICMP met for the first time in November 1989, and the MOC, which meets on a quarterly basis, has conducted six meetings.

MOC Subcommittees

Ten interagency MOC subcommittees¹ have been established, but progress has been limited. Only the subcommittee concerned with construction has convened, and it has met three times. Commerce's Director, Office of Metric Programs, has drafted a charter for each of the subcommittees, and chairmen have been appointed to nine of them. He told us that he is actively encouraging their formation and believes that they will begin to play a larger role in 1990.

Internal Agency Committees

Ten agencies indicated that they have developed internal committees. These agencies include Commerce, DOD, GPO, GSA, NASA, NRC, Treasury, HHS, HUD, and the U. S. Postal Service. Three more agencies (Energy, State, and SBA) reported plans to form such committees.

The level of activity in these committees has varied by agency. For example, NRC's committee was responsible for producing the detailed report that reviewed NRC's main areas of concern and options for metric conversion. Other internal committees at GSA, DOD, and GPO have been active in developing metric transition plans. Officials at NASA and the U.S. Postal Service indicate that their committees have been dormant but are being reactivated. HUD has recently formed an ad-hoc committee to explore conversion issues. An HHS official describes HHS' committee as

¹MOC subcommittees include Consumer Affairs, Construction, Federal Employee Training, Health Care, Legislation and Regulations, Metric Practices and Preferred Units, Procurement and Supply, Public Education and Awareness, Small Business Assistance, and Transportation.

extent. GSA, another of the key agencies in the transition, has undertaken efforts only with regard to federal regulations, while noting that the review of thousands of agency specifications remains to be done.

We also asked agencies about their activities in six specific areas. These areas included the following possible actions: (1) disseminating educational materials on the metric system to the public; (2) including metric language in procurements, grants, or other business-related activities; (3) notifying vendors of orders for metric goods and services; (4) meeting with associations, non-profit organizations, and standard bodies to discuss metric transition issues; (5) meeting with the private sector to discuss metric transition issues; and (6) giving assistance to small businesses on metric issues.

Our findings can be summarized as follows:

- 12 agencies reported that they have activities currently underway in one or more of these categories.
- 10 currently include metric language in procurements, grants, or other business activities.
- 5 are currently meeting with associations, non-profit organizations, and standard bodies to discuss metric transition issues.
- 2 or fewer reported current activities in each of the remaining areas.

A larger number of agencies plan to conduct activities in these areas in 1990. A total of 19 agencies reported planned activities in one or more of the six areas. The ones most frequently mentioned, arranged in descending order, are: inclusion of metric language in procurements, grants, or other business-related activities (15 agencies); notification to vendors of orders for metric goods and services (12); meeting with associations, non-profit organizations, and standard bodies to discuss metric transition issues (11); meeting with the private sector to discuss metric transition issues (7); dissemination of educational materials to the public (6); and assistance to small businesses on metric issues (5).

The agencies indicating the greatest number of planned activities include GSA (all six areas), DOD, NASA, and SBA (five areas), and Commerce and NRC (four areas). In addition, Labor, State, the Treasury, and OPM plan for activities in three of the six areas. Nine agencies reported plans regarding one or two of these activities. The remaining 21 agencies provided no indication on the questionnaire of expected activities in any of the six areas.

Much Remains to Be Done

In spite of such individual initiatives, the overall impression that only a limited amount of progress has been made so far was confirmed by the agencies in response to our questionnaire. At the end of the questionnaire, we asked them to estimate the percentage of total work for metric conversion (including guidelines, plans, and other activities) remaining to be completed in their respective agencies. A total of 27 agencies, including Commerce, DOD, and GSA, indicated that 75 percent or more remains to be done. Only five agencies reported less than 75 percent. These five included Treasury, Consumer Product Safety Commission, FCC, Federal Maritime Commission, and SBA. Five agencies did not specifically respond to the question.

The lead agency for the transition also indicated problems in this regard. Commerce's Director, Office of Metric Programs, described the Department's difficulties in adequately guiding and coordinating the conversion effort with the current level of resources. He stated that the two professionals and current support services are simply unable to cope with the accelerated metric activities. In January 1988, he proposed a modest increase in resources equalling about 1.5 staff years but has received no response to it. Commerce's reply to the questionnaire indicated an expectation of about 5 staff years for this effort in fiscal year 1990, but these resources have not been provided.

The metric coordinator at GSA stated that the staffing level at Commerce is inadequate to guide the metric conversion effort. In its response to our questionnaire, GSA also stated: "We believe the federal government's metric conversion activities would be greatly enhanced if Commerce were adequately staffed. This also would ensure greater uniformity in activities taken by the agencies and probably would reduce the expenditure of agency resources in the long run." The metric coordinator at DOD also expressed doubts about the ability of Commerce to play the lead role at the current staffing level.

In addition, several metric coordinators noted the adverse effect on the overall "morale" of federal conversion efforts, when Commerce, the lead agency, has limited its own resources in this area. The coordinators at GSA, DOD, and NASA have indicated to Commerce's Director, Office of Metric Programs, that they have encountered added difficulties in furthering metric conversion in their own agencies because of the perceived lack of support within Commerce. A metric coordinator at one of the small agencies expressed a similar view to us. He said that when the lead agency plays such a limited role, he wondered why his own agency should do anything at all.

A lack of resources also handicaps the other major civilian agency in the transition. GSA reported even fewer staff years—1.25—than Commerce for the transition in fiscal year 1989. As one example of work to be done, GSA's metric coordinator states that thousands of procurement-related GSA documents need to be reviewed, but he is uncertain of the availability of the resources to accomplish the task.

In terms of resources needed to complete the task of conversion, we found only one agency that had specifically attempted to estimate the amount of support that would be required for its conversion to the metric system. NRC's report on metrification states that approximately 20 to

to the construction subcommittee. The uncertainty about responsibility for appointing members accounts to a great extent for the fact that the GSA-chaired subcommittee on procurement and supply has possessed a chairman but no members for about a year.

The education subcommittee provides another example of the lack of coordination and progress in this regard. The current Department of Education officials designated by Education as responsible for metric issues told us that they did not become aware until October 1989 at the ICMP meeting that they were supposed to chair this particular subcommittee, although a briefing of Education officials by Commerce officials had been held in early 1989 to discuss Education's role in metric education, including this subcommittee.

We also found some evidence of frustration within agencies about the lack of progress in this area. For example, Treasury's metric coordinator told us that his agency had designated Treasury officials for various subcommittees but that the lack of appointments from other agencies has prevented them from meeting.

Signs of progress in 1990, however, suggest that more subcommittees may begin to convene. At a meeting of the MOC in January 1990, the assistant to the Director, Office of Metric Programs, stated that almost all of the subcommittees now have enough members "on board" to begin convening regularly. He also strongly encouraged the approximately 40 MOC representatives in attendance to continue pressing their agencies for nominations to fill the remaining vacancies on the subcommittees.

MOC Subcommittees and the Private Sector

Although the MOC subcommittees are to be staffed by federal agency personnel, the draft charters developed for the subcommittees clearly indicate that the subcommittees are to have an important role in coordination not only among the agencies but with the private sector. For example, the construction subcommittee is expected to interact with American industry, labor, and other public and private sector representatives. The charter for the health care subcommittee refers to interaction with hospitals, pharmaceutical companies, and medical groups. The procurement subcommittee is expected to interact with industry and small business procurement representatives. The Director, Office of Metric Programs, said that he considers the subcommittees an important link between the federal government and the private sector; he believes that the difficulties in convening the subcommittees have reduced the

GSA stated in its draft metric transition plan that construction in the United States is almost totally in inch-pounds and will probably be one of the last industries to transition fully to metric. The long life of buildings, dams, factories, and other structures means that inch-pound repair parts may be needed for decades after transition. To satisfy the requirements of the law, GSA stated that it must work closely with the construction industry in the development of short- and long-range transition plans.

Similarly, HUD expressed strong concerns about the construction industry. It stated that the home building industry is a scattered, diverse industry basically organized at the local level. It is, according to HUD, very conservative in changing to new ideas. Imposing metric measurements on this industry, which also must meet local building code and other regulatory requirements, would have a short-term negative impact due to over-regulation.

The other agencies mentioned above also indicated a variety of concerns in converting the construction area to the metric system. For example, Justice is concerned about constraints on its prison construction program.

The fact that the construction industry will need a long time for metric conversion, according to Commerce's Director, Office of Metric Programs, necessitates early and extensive planning; for this reason, it is especially important that the MOC construction subcommittee has already gotten underway.

Other Areas of Concern in the Private Sector Identified by Agencies

Many agencies identified other areas of concern besides construction. The following selection is intended to illustrate the variety of these concerns.

- DOD has conducted an assessment of the different areas of procurement in terms of their amenability to metric conversion. It indicated in its metric transition plan the particular areas where it expected difficulty. In addition to construction, it identified food, clothing and textiles, and commodities.
- TVA reported that measurement-sensitive concerns in the private sector are very likely to hinder its transition. It notes that the research, trade, and vendor community in the American electric power industry are not proceeding with metric conversion.

decided in late 1989 not to “go metric” with the space station. In practice, this means that inch-pounds will be the predominant units of measurement for the space station but that specific systems can be procured in metric units where cost does not become a barrier.

With regard to procurement in other agencies, DOD,¹ Justice, GPO, GSA, the Interstate Commerce Commission, and SBA reported that procurement costs would increase somewhat as a result of conversion. TVA expects its costs for procurement to greatly increase.

Justice, GPO, GSA, the Smithsonian, and TVA expect the costs for other business activities to increase somewhat. Labor reports that its costs for other business activities regarding the Mine Safety and Health Administration will greatly increase as a result of conversion.

Almost without exception, however, the agencies surveyed indicated that costs for grants would neither decrease nor increase as a result of conversion or that they did not know (at the time of the questionnaire) what the effect would be. Only TVA indicated that its costs would increase somewhat.

Education

Although the Metric Conversion Act, as amended, directs agencies to increase understanding of the metric system through educational information and guidance, the Department of Education as of January 1990 had not established a policy for responding to this requirement nor had it appointed a chairman to the MOC subcommittee on education. (Additional discussion of Education and metric education activities in other agencies is contained in chapter 5.)

Conclusion

We believe that progress in metric conversion may be outweighed by the problems associated with implementing it. A combination of factors—including minimal staff resources, difficulty in organizing the MOC’s subcommittees, and measurement-sensitive concerns in the private sector—suggests that conversion may take longer than the Congress may have intended.

¹ DOD stated that short-term procurement costs will increase somewhat but will be outweighed by long-term cost avoidance.

Metric Education Activities in Federal Agencies

Because education is specifically addressed in the third amendment to the Metric Conversion Act and is an important element in implementing any program changes, we address this issue separately in this chapter. In general, metric education activities in federal agencies provide examples of both progress and problems. DOD states that it provides metric training as needed, and GSA has drafted a formal plan to do so. Progress in other agencies is more limited, and some problems, especially in the Department of Education, are evident. We reviewed the status of metric activities in the Department of Education, the National Science Foundation, SBA, Labor, GSA, and DOD.

Progress at Several Agencies

In its January 1989 transition plan, DOD indicated that it had assigned a task force to develop a metric education program. However, in a meeting on March 8, 1989, and a subsequent memo on June 20, 1989, the task force concluded that DOD "...at this time, does not need a common metric education/training program. The [Department] currently trains those individuals who need a 'working knowledge' of the metric system to do their jobs. This training will be expanded as more weapon systems are built using metric measures. This process is and, in the near term, should continue to be completely adequate to satisfy the needs for metric trained personnel."

GSA's draft transition plan states that "a comprehensive program to educate personnel throughout the agency is needed." The Agency's metric coordinator is considering further plans to implement a program that would range from basic orientation to specialized training. He said that GSA's Training Center conducts hundreds of courses around the country and would serve as the focal point for the Agency's metric education efforts.

The National Science Foundation's Assistant Director, Directorate for Science and Engineering Education, presented a positive picture of the widespread use of the metric system in grade and high school science curricula. The Agency is funding about a dozen large curricula development projects, most of them focused on the kindergarten through sixth grade level. The Agency plans to fund high school curricula development projects, which will be in a metric format.

Labor issued a metric-related bulletin to state apprenticeship programs in December 1989. The bulletin recommends strongly that the states include instruction in the metric system as a part of their programs. In

When asked whether the Department knew the status of metric education in the school system, senior officials stated that they had only limited anecdotal information but nothing more comprehensive or systematic. As a result, they could not discuss with certainty the size of the “gap” between the current metric education opportunities in the school system and the possible goal of “metric literacy.”

Education officials also discussed various opportunities for the Department to exert leverage on behalf of the metric system. For example, certain organizations could be used to publicize the metric policy; the Council of the Chief State School Officers would be one possible forum. The Department can also exert some limited leverage through meetings with the community that controls the content of textbooks and curricula. It could also exert some metric influence through its \$2 billion grant programs, but it pointed out that it has no authority or mandate to require state or local districts to use a portion of these funds for this particular purpose. Subsequent discussion indicated that these possibilities had not yet been considered in any detail, and no decisions had been made regarding them.

Should an Education Program Be Developed?

In the original request letter, the Chairman asked us whether an education program focusing on the metric system should be developed by a federal agency (or agencies). We believe that this question is being addressed, at least in part, through the activities of DOD and GSA. DOD, as noted previously, considers its existing approach to metric training adequate to meet its needs and does not consider a full program necessary. GSA has perceived a need for a somewhat more formal program in its own agency. The activities at DOD and GSA appear to be appropriate in view of their key roles in the metric transition.

We believe that the interagency MOC subcommittee on education, which is to be chaired by Education, has a potentially important role to play in addressing the full range of metric-related education issues throughout the federal government. Since our recommendation to the Secretary of Commerce regarding the need to staff and convene the MOC subcommittees includes the education subcommittee, we are making no additional recommendations concerning this issue.

Staff Years Allocated for Metric Conversion by Federal Agencies

Agencies were asked to report staff years allocated in fiscal year 1989 and estimates for fiscal year 1990.

Agency	FY89	FY90
Department of Agriculture	0.10	0.60
Department of Commerce	3.50	5.00
Department of Defense	10.60	5.10 ^a
Department of Energy	0.30	3.20
Department of Education	0.05	0.05
Department of Health and Human Services	0.00	^b
Department of Housing and Urban Development	0.10	0.75
Department of the Interior	0.05	0.10
Department of Justice	0.25	0.63
Department of Labor	0.90	0.90
Department of State	0.00	1.00
Department of Transportation	0.00	0.00
Department of the Treasury	0.41	0.64
Department of Veterans Affairs	0.13	0.13
Central Intelligence Agency	0.13	0.50
Commodity Futures Trading Commission	0.00	0.00
Consumer Product Safety Commission	0.10	0.10
Environmental Protection Agency	0.00	0.20
Federal Communications Commission	0.40	0.40
Federal Emergency Management Agency	0.01	0.05
Federal Maritime Commission	0.00	0.00
Federal Reserve Board	^b	^b
Federal Trade Commission	^b	^b
Government Printing Office	1.00	5.00
General Services Administration	1.25	^b
Interstate Commerce Commission		^c
National Aeronautics and Space Administration	0.70	1.80
National Science Foundation	0.00	0.00
Nuclear Regulatory Commission	0.80	3.10
Office of Personnel Management	0.00	0.50
Office of the U.S. Trade Representative	^b	^b
Small Business Administration	0.90	1.40

(continued)

Additional Information Provided by Agencies on the GAO Questionnaire

Agencies provided additional information that is helpful in understanding their efforts to implement the amendments to the Metric Conversion Act. The following excerpts are taken directly from their responses to the GAO questionnaire.

Department of Commerce

Commerce stated that its various units are at different stages in their planning and efforts. The National Institute for Standards and Technology, as a scientific unit, has more widespread use of metric units than the Office of Economic Affairs. Also, more of the Department's export promotional publications have begun wider use of metric units than have the in-house or consumer-oriented publications.

Department of Defense

DOD has what are called "buy commercial" policies, but the volume of DOD purchases, while large, does not provide sufficient leverage to induce metrication in most commercial areas. The Department added that in many of the "buy commercial" areas the industry appears to have no plans to change and this adversely affects DOD's move to the metric system. Moreover, in some "military unique" areas the industry maintains that transition will result in significant cost increases. DOD also noted that some international laws or multinational agreements require use of nonmetric units, e.g., international air navigation and meteorological reporting.

Department of Health and Human Services

HHS stated that in the Department and the private sector the metric system is appropriate for and used extensively in the health care and medical research areas. (It is used because of its simplicity, a decrease in error rates, and the necessity for exchange of dialogue between various countries.) HHS uses the metric system in many areas of its clinical health activities, including both inpatient and outpatient units, medical records, rehabilitation medicine, nursing, and pharmacy. In addition, most of the medical research supported by the Department through grants and contracts is metric-oriented, and it uses the metric system extensively in developing specifications for specialized medical/laboratory equipment. HHS also indicated that the private sector performs much of its research and provides health care using the metric system of measurements and physiological standards. In particular, drug dosages, medical equipment, and measurements of the human skeletal system, circulatory system, muscles, and other areas are specified in metric measure.

It also described the metric-related concerns of each of the nine program agencies, indicating that some of them are evaluating metric conversion opportunities and using the metric system in specific areas. The situation in each program agency was summarized as follows:

- The Coast Guard coordinates all its standards practices with the Navy and the Department of Defense. A team is evaluating the Agency's response to the Trade Act and is preparing a Commandant Instruction for future policy guidance.
- The Federal Aviation Administration's Office of Aviation Policy and Plans is evaluating the practicality of converting the Air Traffic Control System and safety regulations to metric standards.
- The St. Lawrence Seaway is coordinating all its policies and practices with the Seaway of Canada and may already be in conformity with the Trade Act.
- The National Highway Traffic Safety Administration follows closely metric developments in the automotive industries and permits the use of metric standards in safety regulations to the extent that they are practical and do not compromise safety.
- The Federal Highway Administration is forbidden by the Surface Transportation Act of 1978 to provide for the utilization of metric measures exclusively on highway signs on the Federal Aid systems. Construction standards and specifications on grants are jointly determined with the states. Metric applications depend on the progress of state efforts.
- Most Urban Mass Transportation Administration grants are for automotive equipment used in mass transit. The practicality of metric usage hinges on the adoption of metric standards and practices in the automotive industries. Rail equipment is often procured abroad with many metric standards used in its construction.
- The Maritime Administration attempts to coordinate its standards and practices with the international shipping community, operating through specialized maritime organizations, and has been active in exploring metric usage in the U.S. shipping sectors. Moreover, recent legislation has permitted the construction of U.S. flag vessels abroad, with further impetus toward metric standards.
- The Research and Special Programs Administration's safety regulations apply principally to the oil and gas industries, and metric adoptions depend on the policies of such industries.
- The Federal Railroad Administration must deal with long-standing railroad usages and practices that govern safety regulations in the railroad industry. The practicality of converting these to metric standards has not been determined.

General Services Administration

GSA stated that one of its concerns involves the need to ultimately review thousands of specifications and standards, presumably without additional resources. Other concerns involve the potential need to develop appropriate metric language for inclusion in solicitations and contracts and to establish uniform procurement practices for all federal agencies. It added that in dealing primarily with suppliers of commercial products and service, it can encourage its suppliers to convert to the metric system but cannot dictate to them. This may delay GSA's total transition to the metric system and require GSA to deal with varying degrees of metric usage for years to come. GSA's Office of Acquisition Policy (V) has established the GSA Metric Steering Group to coordinate the agency's metric transition efforts. All affected services and staff offices are represented on the steering group. Upon request, GSA has provided copies of its draft metric guidelines and transition plan to other agencies for their information and use in developing their own documents.

National Aeronautics and Space Administration

Among federal measurement-sensitive concerns that may affect its transition to the metric system, NASA has identified federal specifications or standards. In this regard, its major concerns are availability of technical standards and supporting reference data (e.g. materials properties), availability of qualified metric parts, and experience. (It added that "experience" is an indirect but important factor in the sense that it is the proof of reliability, an essential prerequisite of space programs.) NASA reported that it has modified or proposed modifying existing regulation(s) and specified or proposed new technical specifications or standards. It stated that a proposed modification to the NASA Federal Acquisition Regulations would facilitate metric replies to procurement requests where functionality and safety requirements are met.

NASA believes that measurement-sensitive concerns in the private sector are very likely to hinder transition. Internal standards, design practices and procedures of the aerospace industry are generally inch-pound. Conversion of the above is only the first step; verifying and gaining confidence in the revised standards, practices, and procedures is expected to require additional effort, expense, and time. NASA added that small demand for metric systems is also a major barrier to conversion in that "first" programs can bear a disproportionate share of the conversion burden. In further comments, NASA stated that the technical complexity and high safety and reliability requirements of NASA programs generally require long lead times for planning, evaluation of alternatives, design, testing, and verification. Metrication will occur, but ensuring that other

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constraints are not violated will take time. Metrication is further complicated by the generally “one of a kind” nature of NASA’s programs. Also, the metric transition may be impractical for certain sectors of the aerospace industry, a consideration that forecasts transition problems in this area.

Nuclear Regulatory Commission

NRC commented that its current regulations use conventional units, although in a few exceptions dual units are used. (For example, the proposed revision to 10 C.F.R. part 20, Standards for Protection against Radiation, uses dual units.) NRC must also be responsive to federal laws such as the Clean Air and Clean Water Acts, and the Nuclear Waste Policy Act. The acts use conventional units and are the primary responsibility of EPA and the Department of Energy respectively. NRC believes that measurement-sensitive concerns in the private sector are somewhat likely to hinder transition. In this regard, it commented that the nuclear industry currently operates and communicates with NRC in conventional units. Any changes undertaken by NRC to convert to metric must be consistent with the metric conversion by the nuclear industry due to the health and safety aspects of regulating nuclear power. It intends to coordinate its metric conversion activities principally with Energy, EPA, the Federal Emergency Management Agency, and the Food and Drug Administration. These coordination activities will include high level waste management and regulation and emergency response operations. It has identified no procurements and grants that might be excluded from conversion, but one business-related activity might be excluded. This activity involves emergency communications with licensees; exclusion is to be based on considerations of safety and impracticality.

United States Postal Service

The Postal Service has identified federal measurement-sensitive concerns, including federal specifications or standards and other concerns, that may affect its transition to the metric system. In particular, it noted that it is regulated as far as rates are concerned by the Postal Rate Commission. The Postal Service’s current size and weight standards would have to be changed; this is a lengthy and difficult process. Its postal mailers would have to be convinced that to metrify is in their best interest as they would also have conversion costs.

Department of Veterans Affairs

VA provided very specific details on its metric conversion activities. When submitting new items to the Defense Integrated Data System, VA has been including metric units as required by the Federal Item Identification Guides. The majority of these guides used by the VA have been changed to include metric units in reply tables. In the VA's computerized supply system, metric units are added to the expanded description when industry furnishes metric information in its literature. The VA also discussed in detail its development of a product acceptability clause to comply with requirements contained in the Code of Federal Regulations (50 FR 27578, dated July 5, 1985), Federal Property Management Regulation, 101-29, Standardization Handbook and Federal Standard No. 376, "Preferred Metric Units for General Use by the Federal Government." The clause permits the acceptance of metric products when they fall within the tolerances specified in the standardization document. Conversion tables contained in the latest revision to Federal Standard No. 376 are used to determine the appropriate conversion from inch-pound units to metric units. All other requirements of the standardization document must be met. The metric clause has been adopted for use in a variety of shared procurement activities involving VA, DOD, and the Public Health Service.

Commodity Futures Trading Commission

The Commission regulates trading in commodity futures and options; the underlying contracts are traded in units such as bushels, pounds, and ounces, which are established by other agencies. It noted that GSA contracts use United States' standards. The Commission also remarked that the task of conversion is onerous and that it takes a lot of leadership and coordination. A few lead agencies must convert and then many other private and public agencies will follow.

Federal Trade Commission

The Federal Trade Commission pointed out a conflict between the Trade Act of 1988 and the Fair Packaging and Labeling Act (15 USC 1451 (1966)) enforced by both the Commission and the Food and Drug Administration. The Fair Packaging and Labeling Act, which requires that consumer commodities be labeled as to contents, also requires the content disclosure to be in inches and pounds. Thus, a disclosure solely in metric would be a violation. The Commission suggested that the act may need to be amended.

Department of Housing and Urban Development

HUD stated that it does not generally procure materials and products for its own use, other than normal administrative supplies. It does become involved with the procurement of construction supplies and services for certain HUD-assisted housing. The Consolidated Supply program provides a central point for Public Housing Agencies to obtain certain construction items used to maintain and upgrade public housing, while the property disposition staff in its regional and field offices frequently must contract for the repair and refurbishment of residential units, that have undergone foreclosure, before they are resold. In both programs, HUD is dealing with housing built using the English (non-metric) system of measurements and must specify replacement parts and construction in the same measurement system. In general, since HUD's primary constituencies involved with physical measurement systems are the home building industry, Public Housing Agencies, and organizations concerned with rehabilitating older housing, the Department sees some difficulty in making a major transition to the metric system in the near future. It is, however, working on a departmental policy to initiate this transition.

Department of Labor

Labor noted that the Occupational Safety and Health Administration issued a memorandum in January 1977 requiring all new proposed administration standards to display the metric equivalent. The memorandum states that in the area of occupational health, the majority of health standards have used metric measurements for decades and that over 90 percent of the instruments and other tools provided for its compliance staff are using metric measurements. Labor also states that its Mine Safety and Health Administration and Occupational Safety and Health Administration particularly may need to survey private employers to estimate the impact of metric conversion.

Department of Transportation

Transportation discussed its general policies and activities within its nine program agencies. It stated that the metric-sensitive aspects of these agencies vary significantly from one program to another because of the different technological characteristics. These variations are so great that a general policy dealing with the metric provisions of the Trade Act is not practical at this time. Hence, a program-by-program approach is required. Transportation commented on the significant role of state and local governments, industries and firms subject to its departmental regulations (especially regarding safety), and other federal agencies (especially DOD and GSA) in shaping metric policy.

**Appendix II
Staff Years Allocated for Metric Conversion
by Federal Agencies**

Agency	FY89	FY90
Smithsonian Institution	0.20	0.50
Tennessee Valley Authority	0.10	1.50
U.S. International Trade Commission	0.20	0.20
U.S. Postal Service	3.00	^b

^aDOD noted that these figures do not include time spent by members of its Metric Transition Plan Task Groups. DOD also indicated that total staff years to be allocated for metric conversion in fiscal year 1990 would probably exceed the total indicated for fiscal year 1989, but exact figures were not available at the time of its response to the questionnaire.

^bInformation was not available.

^cAccording to the Interstate Commerce Commission, the staff year allocation was "negligible" during these years.

Agencies Included in the GAO Survey

Department of Agriculture
Department of Commerce
Department of Defense
Department of Education
Department of Energy
Department of Health and Human Services
Department of Housing and Urban Development
Department of the Interior
Department of Justice
Department of Labor
Department of State
Department of Transportation
Department of the Treasury
Department of Veterans Affairs
Central Intelligence Agency
Commodity Futures Trading Commission
Consumer Product Safety Commission
Environmental Protection Agency
Export-Import Bank
Federal Communications Commission
Federal Emergency Management Agency
Federal Maritime Commission
Federal Reserve Board
Federal Trade Commission
General Services Administration
Government Printing Office
Interstate Commerce Commission
National Aeronautics and Space Administration
National Science Foundation
Nuclear Regulatory Commission
Office of Personnel Management
Office of the United States Trade Representative
Small Business Administration
Smithsonian Institution
Tennessee Valley Authority
United States International Trade Commission
United States Postal Service

general, however, Labor officials are only beginning to explore the education-related issues. The Director, Office of Management Support, discussed two possible options—Job Corps training and activities that would involve labor unions. The former would cover only a small fraction of the labor force; the latter would be more comprehensive, but, from the Department's perspective, activities in this area would have to be initiated by industry.

SBA officials told us they are considering a "specific push" on the metric system through self-help articles and SBA's Service Corps of Retired Executives, a group of about 13,000 people who work with small businesses. They said that the Office of Business Development and the Office of Procurement Assistance would be relevant to SBA efforts to promote metric education. They indicated, however, that SBA had not made specific decisions regarding metric education activities.

Specific Concerns About the Department of Education

The president of the U.S. Metric Association, a nonprofit organization promoting the use of the metric system, expressed concern about the slow pace of activity at the Department of Education in April 1989. She expressed her concerns specifically in a letter to the Secretary of Education. Subsequent discussion with senior Education officials in October 1989 indicated that the Department is still at an early stage in its review of the issues.

The first time that the current Education officials learned that the Department was expected to play a leading role in the metric education area was at the ICMP meeting in October 1989, when Education's responsibility to chair the MOC's education subcommittee was mentioned. A chairperson has not been designated. According to Education officials, the information has helped to emphasize the importance of the issue and make it more visible within the Department.

General policies or specific actions have not been determined regarding Education's support for conversion to the metric system. The Department has not issued a statement informing the educational community that metric is now the preferred system but told us that this issue is on the agenda for discussion as a leadership effort. Knowledge of the metric system is not one of the national goals prescribed for high school graduates, but the Department is considering what can be done to include it among these goals.

Recommendations to the Secretary of Commerce

Given the concerns about the low level of resources that have been made available to support the conversion effort and the difficult task of coordinating activities not only among a large number of federal agencies but with the private sector, we recommend that the Secretary of Commerce, as head of the lead agency in guiding and coordinating the federal metric transition, take steps to focus attention on these issues. Specifically, the Secretary should encourage federal agencies to

(1) develop a realistic estimate of the amount of resources needed to ensure the maximum practicable degree of metric conversion and

(2) fill the vacancies on the Metrication Operating Committee's 10 inter-agency subcommittees and convene these subcommittees on a regular basis as soon as possible.

Matters for Consideration by the Congress

Given the problems that we identified and especially the low level of resources that agencies have made available to support metric conversion, the Congress may wish to require that agencies (1) follow guidance provided by Commerce as the lead agency and (2) include in their annual reports to the Congress a realistic estimate of the resources needed and the time frame required to achieve metric conversion.

-
- The Postal Service stated that to “metrify” to a large extent, it would have to convince its vendors and customers to do so. Many vendors and customers do not do business on an international scale. Currently, when the Postal Service buys equipment that was designed in metric dimensions, it still has to convert some parts back to inches to ensure a ready and economical parts supply.
 - Both DOD and GSA emphasized that their ability to influence metrication in the private sector is limited. DOD stated that the volume of its purchases, while large, does not provide sufficient leverage to induce metrication in most commercial areas. GSA stated that in dealing primarily with suppliers of commercial products and services, it can encourage its suppliers to convert to the metric system but cannot dictate to them.

Additional Areas of Difficulty

We also identified other areas of difficulty, including the review and conversion of specifications and standards, considerations of cost, and education.

Specifications and Standards

Several agencies stated that the task of reviewing and converting their specifications and standards will pose difficulties. DOD indicated that although it has begun a review of thousands of specifications and standards, it conducted only a limited review in fiscal year 1989, and a great deal of work remains to be done. (DOD has established a computerized database listing needed metric specifications and standards identified by contractors to support development of metric-based weapons systems and equipment. A plan is being prepared to verify the need for these specifications and standards and to develop them on a priority basis.) GSA stated that only a small percentage of the documents listed in the GSA Index of Federal Specifications, Standards, and Commercial Item Descriptions are metric. Energy commented that it cannot complete its conversion of specifications and standards by 1992. NRC and NASA are also facing a major task in dealing with concerns about specifications and standards.

Costs

Cost considerations are likely to limit the use of the metric system in NASA’s procurement of the space station. NASA estimates the additional costs entailed in metrication of the space station at about \$200 million, based on information it requested from all of the major contractors involved in its development. NASA’s metric coordinator told us that the Agency has no basis to challenge this estimate. As a result, NASA officials

federal agencies' ability to coordinate their metric conversion efforts with the private sector.

Difficulties Relating to the Private Sector

Fifteen agencies, including DOD and GSA, indicated that the federal agency/private sector dilemma that hindered transition efforts in the past will continue to be an active force that interferes with the progress of current conversion efforts. Only three agencies expect the private sector to facilitate their efforts. One of the most difficult areas, according to seven agencies, is construction. DOD and other agencies have identified additional areas of difficulty ranging from food to the electric industry and postal equipment. Even the principal procurement-related agencies, DOD and GSA, stated that their ability to influence metrication in the private sector is limited.

Based on the results of our questionnaire, many agencies indicated that measurement-sensitive concerns in the private sector are likely to hinder their transition to the metric system. We asked the agencies to rate how much, if at all, measurement-sensitive concerns such as specifications and standards in the private sector are likely to facilitate or hinder their transition:

- Eight agencies, including two (DOD and GSA) of the most important, reported that measurement-sensitive concerns in the private sector are very likely to hinder their transition. Others included Education, CIA, HUD, NASA, TVA, and the Postal Service.
- Six agencies consider such concerns somewhat likely to hinder their transition. These included Agriculture, Justice, GPO, NRC, SBA, and the U.S. International Trade Commission.
- One agency—Labor—stated that such concerns are very likely to hinder its Mine Safety and Health Administration's transition and somewhat likely to hinder its Occupational Safety and Health Administration's transition.
- Three agencies (Transportation, HHS, and the Commodity Futures Trading Commission) said that the private sector would be somewhat likely or very likely to facilitate their transition.
- The remaining agency responses indicated no expectations of a negative or positive effect from the private sector.

Construction as a Major Area of Concern

One of the major areas of concern is construction. A number of agencies, including GSA, HUD, DOD, State, CIA, OPM, and the Smithsonian, referred to their concerns about this area of activity.

25 full-time equivalent staff and \$2 million to \$3 million in contractual support spread over the 1990-1997 time frame will be needed.

We are concerned by the relatively low number of staff years assigned to the conversion effort and by the comments of some of the most important agencies in the transition. In particular, two of the three major agencies in the transition, Commerce and GSA, applied a total of 4.75 staff years to the task in fiscal year 1989.

Difficulties in Coordinating Metric Conversion

Coordinating the metric conversion is a formidable task because it must take into account the exceptionally large number of agencies and issues. For purposes of coordination in such a complex environment, the role of interagency committees becomes a paramount concern.

A particular area of concern is the difficulty in organizing the interagency MOC subcommittees, although signs of progress in 1990 suggest that this problem is being addressed. These subcommittees, as listed in chapter 3, include many of the major areas and challenges facing the federal government in its metric transition. Various statements testifying to their potential importance have been made. For example, Commerce's metric coordinator considers them "crucial" to implementing the transition. DOD states that most of its 16 task forces have emphasized that it is vital that the subcommittees be established and working for a government-wide effort to proceed. DOD concluded that its ability "unilaterally to make substantial metric transition progress is quite limited."

In spite of this recognition of the subcommittees' importance, we found that as of January 1990, only one of them—the construction subcommittee—had actually conducted a meeting. The construction subcommittee has met three times and is being chaired by a Navy official who is concerned about the extent of the barriers to metric conversion in the construction industry. With the help of Commerce metric officials in identifying task force members from other agencies, the chairman staffed the subcommittee and organized the meetings.

However, other subcommittees have not convened. One source of problems in organizing the subcommittees has been uncertainty regarding who is responsible for appointing members. Commerce's Director, Office of Metric Programs, wrote a draft charter for each of the subcommittees and notes that 9 of the 10 are currently chaired. He considers it the responsibility of the chairmen to appoint the other members, although he has demonstrated his willingness to assist in this process with regard

Problems Relating to Metric Conversion

Problems relating to metric conversion are sufficiently serious to call into question the federal agencies' commitment to the conversion. Staff resources available to guide the effort at Commerce and GSA have been minimal. Resources in most other agencies are also very limited. Difficulties in coordinating the conversion between agencies are conspicuous; in particular, 9 of the 10 interagency MOC subcommittees have not convened their first meeting. Moreover, the long-standing problem of coordination with and conversion of the private sector to the metric system is perceived as a likely obstacle by 15 federal agencies, including DOD and GSA. Other areas of concern, such as the review of specifications and standards, costs resulting from conversion, and education, pose additional problems to various agencies. We believe that corrective actions need to be taken regarding the problems relating to metric conversion.

Limited Resources Available for the Conversion Effort

We found that 27 agencies reported that less than 1 staff year was used for such work in fiscal year 1989; 5 agencies reported 1 to 5; and only 1 agency (DOD) reported more than 5 staff years. Three agencies did not report a specific figure for fiscal year 1989. The numbers for fiscal year 1990 showed 20 agencies reporting less than 1 staff year and 9 agencies reporting 1 or more. Two agencies (GSA and the U.S. Postal Service) indicating more than 1 staff year in fiscal year 1989 stated that they could not provide the data for the current fiscal year, but, based on fiscal year 1989, it seems likely that they will assign more than 1 staff year again, raising the total number of agencies with more than 1 to 11. Again, only DOD reported more than 5 staff years. Four agencies did not report a specific figure for fiscal year 1990. (Appendix II provides the exact response from all of the agencies.)

Several key agencies expressed strong concerns about the adequacy of staffing and resources. DOD, for example, stated that there is considerable feeling within the Department that the U.S. metric program lacks national direction and, most importantly, dedicated resources for effective and efficient metric implementation. GSA stated that one of its concerns involves its need to ultimately review thousands of specifications and standards, presumably without additional resources. Energy stated that neither the private sector nor the federal government is expending sufficient effort or resources in developing the necessary metric standards for the Department to implement the amendments by 1992. In its response to the questionnaire, Energy added that it planned to recommend this concern about inadequate resources as a priority issue for the MOC to address.

We also found some very recent examples of additional activities indicating progress toward metric conversion. The following list is intended to be illustrative rather than exhaustive:

- Several agencies conducted activities that involved the public. Commerce officials helped organize and chaired a two-day national conference in October 1989 attended by more than 200 representatives from the public and private sector. The conference was the largest in the 1980s dealing with metric conversion issues. NRC officials conducted a 2-day hearing in November to gain public input on their metric conversion activities. GSA obtained about 65 generally favorable public comments on its proposed guidelines in late 1989.
- NASA's metric coordinator conducted a survey regarding support of metric projects by general and aerospace machine shops. The survey focused on small machine shops, which are occasionally cited as a "barrier" to metrication. In November 1989, the coordinator summarized the major findings. Among them: 39 of the 40 shops contacted had actually performed metric projects at one time or other; many had a significant amount of their business in metric operations. The capability to go metric is available if the client requests or requires it.
- Commerce's National Oceanographic and Atmospheric Administration is currently evaluating a new metric-based code that would be used in reporting and forecasting selected weather data. Elements such as temperature, dew point, and visibility would be reported in metric units. International review will be given the proposal in late 1990. If approved, an implementation date of about 1994 will be established.

Agency Response to the Reporting Requirement

The Metric Conversion Act, as amended, also required each federal agency, as part of its annual budget submission, to report to the Congress on its actions to implement the metric system. Four agencies—DOD, NASA, Treasury, and GSA—complied with this requirement in 1988. Various factors, such as the passage of the law relatively late in the year and agency uncertainty whether a report was required in 1988, accounted for the limited number of responses. Additional agencies are responding to the reporting requirement for 1989. The Director, Office of Metric Programs, who has requested agencies to submit copies to his office, told us in March 1990 that at least 12 agencies have submitted their reports and that more reports are being prepared.

a loosely affiliated network, which met for the first time in December 1989.

Internal Agency Task Forces

In addition to these internal agency committees that oversee transition efforts within the agencies, individual task forces concerned with specific areas of metric conversion are also being organized. For example, DOD has established 16 task forces,² which have been directed to identify the areas where metric transition is required. GSA is in the process of establishing seven task forces,³ and other agencies, such as GPO, are considering the use of such groups.

Other Activities Indicating Metric-Related Progress

A variety of other agency activities is also underway to a limited extent. These activities include the identification of federal measurement-sensitive concerns; specific initiatives such as the inclusion of metric language in procurement, grants, or other business-related activities; and other activities such as a national metric conference and public hearing on metric conversion.

In response to our questionnaire, 14 agencies reported that they have identified federal measurement-sensitive concerns, including one or more of the following: federal law(s), federal regulation(s), agency directive(s), and federal specifications or standards. The areas of concern most frequently cited involved federal specifications or standards (11 agencies) and federal regulations (7 agencies).

Eleven agencies reported efforts to revise agency guidelines in one or more areas, including the actual or proposed development of new regulation(s), modification of existing regulation(s), development of new specifications or standards, modification of existing specifications or standards, and modification of publications to include metric language. The extent of these individual agency efforts, however, is somewhat limited. For example, DOD, which has been reviewing many of these areas, stated that these activities had occurred to only a very limited

²DOD task forces include Transition Management; Operations, Safety, and Interoperability; Logistics; Education and Training; Specifications and Standards; Construction; Food; Electronics; Clothing and Textiles; Commodities; Test, Measurement, and Diagnostic Equipment; Health; Public Affairs; Metrication Handbook; Interface With Metric Countries; and Cost Evaluation Guidelines.

³GSA task forces include Transition Management, Education and Training, Specifications and Standards, Construction, Electronics, Internal and Public Affairs, and a Metrication Handbook.

has meant a reduced level of advocacy within the Department for metric conversion. However, Commerce has attempted to fill the position and is optimistic that the vacancy will be filled in the near future; in fact, the confirmation process for a nominee is expected to be underway in early 1990.

Some agencies show early signs of progress. GPO, one example of an active agency, furnished ample evidence reflecting its commitment to conversion. GPO's progress appears to result from the strong support provided by its ICMP and MOC officials. In addition to the detailed guidelines and work on a transition plan noted in chapter 2, GPO has formed an internal metric committee and allocated a relatively high level of staff years (5) for 1990 in the conversion effort. At the request of GPO's metric coordinator, Commerce's Director, Office of Metric Programs, made a presentation on metric conversion attended by about 60 senior GPO officials.

We also noted examples of a high level of activity and commitment among members of the MOC. For instance, Commerce's metric coordinator has played a pivotal role in organizing the MOC meetings, advocating metric conversion in speeches to the private sector, bringing together more than 200 federal and private sector officials at a national conference on metric conversion, and taking part in other conversion-related activities. Treasury's metric coordinator has been instrumental in helping to focus that agency's activities and reporting on progress within the various branches of the Treasury.

Although some agencies reflect a growing commitment, many appear uncertain about the importance of conversion.

Limited Dissemination of Information on the Amendments

Fourteen of the 37 agencies in our survey reported efforts to inform key officials of the Metric Conversion Act, as amended. The remaining 23 agencies reported that no efforts have been made in this regard. The 14 agencies reporting efforts in this area included Commerce, DOD, Energy, HUD, Justice, Labor, State, Treasury, GPO, GSA, NASA, NRC, the Smithsonian, and TVA. This list comprises many of the larger agencies; nonetheless, some of the major departments, such as Agriculture and Transportation, reported no activity.

Conclusions

Agencies have conducted only limited planning activities for metric conversion. In addition, problems with the content and timeliness of guidelines are evident. Moreover, no agency has provided us with a plan indicating the extent of metric conversion by 1992.

Recommendations to the Secretary of Commerce

Given the problems with the content and timeliness of agency guidelines and the general absence of time frames for metric conversion, we recommend that the Secretary of Commerce, as head of the lead agency in guiding and coordinating the federal metric transition, take steps to focus attention on these issues. Specifically, the Secretary should encourage federal agencies to

- (1) conform with the DOD Directive 4120.18 on metric conversion in preparing their guidelines and prepare these guidelines as soon as possible and
- (2) develop specific time frames in their guidelines or transition plans to measure their progress toward metric conversion.

activities. They also raise the question of whether agencies will conform with the model provided by the Congress.

In addition, many of the agencies surveyed did not provide a date by the end of 1990 for completing the guidelines. Three agencies do not expect to finish their guidelines until 1991 or 1992. Twelve agencies did not provide a date when they would be completed. Thus, many agencies either did not indicate when they will finish their guidelines or said it would take another year or longer to complete them.

Development of Transition Plans

Only 1—DOD—of the 37 agencies reported to us that it has developed a formal, agency-wide transition plan; a second agency—GSA—has drafted such a plan. However, these agencies include two of the three most significant ones in terms of determining the overall success of the effort. A third agency, NRC, has made a detailed review of options for developing a transition plan.

DOD issued its Metric Transition Plan, approved by the Secretary of Defense, in January 1989. The purpose of the plan, according to the Department, is to describe a comprehensive and integrated program to comply with the amendments. The plan discusses DOD's overall strategy for metrication, defines general requirements and procedures applicable to transition efforts, and details the tasks to be accomplished by designated DOD organizations. Each task description includes a background section on current status and needs, a list of required actions, goals (milestones), and responsibility assignments. The plan includes a total of 16 separate tasks that are identified in chapter 3.

GSA has developed a draft transition plan that is modeled after the DOD plan. In its discussion of metrication strategy, GSA states that all procurements, grants, and business-related activities are now affected and that GSA's efforts will be fully integrated with the efforts of the entire government. As with DOD, GSA's plan is divided into a variety of major tasks. Final approval of the plan is expected by the end of March 1990.

A third agency, NRC, developed a draft "Metrication Committee Report" in August 1989. The report contained the findings and recommendations of NRC's Metrication Committee, which was charged with reviewing NRC activities for possible conversion to the metric system and developing proposed schedules of activities to be converted. The report identified five major areas of NRC activity for discussion and considered three

Limited Planning for Metric Conversion

The agencies surveyed are at a very early point in their planning for conversion to the metric system. The role of guidelines and transition plans in achieving this conversion is important. Metric conversion guidelines may include such basic information as agency policy, responsibilities, and reporting requirements; transition plans may include additional details and specific areas for agency review and conversion. However, only limited steps have been taken by most agencies to prepare guidelines and to develop plans for specific areas, such as procurement, training, and numerous other areas.

As a first step, the agencies were required to establish guidelines for metric conversion as soon as possible after the passage of the amendments in August 1988. At the time of our survey in October 1989, only five agencies indicated that they had completed their guidelines. The majority of guidelines are expected to be completed in 1990, when 16 agencies plan to complete them. In addition to determining the status of agency guidelines, we identified problems with their content and timeliness.

With regard to transition planning, we found that only a few agencies have advanced very far in this direction. In particular, DOD has completed and GSA has drafted a formal plan identifying numerous areas for review and establishing task forces to address these areas; NRC has developed a detailed draft report identifying five major areas for review and examining its options for conversion. Agencies have not developed timetables by which to measure progress in achieving metric conversion. We believe that corrective actions need to be taken to improve the planning for the conversion.

Status of Agency Guidelines

The legislative mandate requiring guidelines as soon as possible from each federal agency emphasizes their obvious importance in the metric conversion effort. These guidelines constitute the first basic step in the direction of metrication. Given the priority placed on them by the legislation, we obtained information on this subject in our survey of the 37 agencies. We asked the agencies to report the date when they completed or expected to complete their metric conversion guidelines. Their responses can be divided into the following three categories:

- Five agencies reporting guidelines completed: DOD, Department of Veterans Affairs (VA), Federal Communications Commission (FCC), Government Printing Office (GPO), SBA;
- Twenty agencies providing an expected year for completion:

may involve problems in changing to metric units of measurement.) Additional activities—to cite only two examples—can include the dissemination of materials on the metric system or the inclusion of metric language in procurement, grants, and other business-related activities. (See chapter 3.) Efforts to achieve metric conversion are affected by the availability of resources, problems of coordination, and other factors. (See chapter 4.) Because metric education is specifically mentioned in the Metric Conversion Act, as amended, and is an important element in any program changes, we reviewed this area of activity in a separate chapter. (See chapter 5.)

Metric Transition: Inevitable but Difficult

A sense of the inevitability of metric transition is becoming more evident. Statements or documents obtained from all three of the principal agencies reflect this viewpoint. The Director, Office of Metric Programs, Commerce, told us that the inevitability of metrication for most U.S. industry can no longer be denied. GSA's draft of its Metric Transition Plan (September 1989) states: "The conversion to metric by the automotive industry, farm equipment manufacturers, and to some extent, other industries plus the move to the metric system by virtually all other countries make it inevitable that the U.S. become a metric-based nation." Similarly, DOD's Metric Transition Plan (January 1989) states: "[R]ecognizing that transition is inevitable, it is imperative that actions be planned and executed to ensure the transition is as efficient and economical as possible." In its report on metrication, NRC concluded that "the subject of metrication is complex, with many technical, safety, economic, and political ramifications. However, the inevitability of such a conversion seems to be generally accepted."

In spite of this growing sense of inevitability, the transition to the metric system is beset by various difficulties. According to the Director of Commerce's Office of Metric Programs, there is still a feeling that the government is embarking on another doomed effort reminiscent of the voluntary and unsuccessful attempt to encourage a transition in the 1970s. Several members of the MOC indicated that budget constraints are limiting the resources available for the transition. One MOC member noted that the issue of metric conversion is not central to agency missions and therefore faces added difficulties in competing for resources. The problem of coordinating the transition among the federal agencies poses a particularly difficult challenge.

Introduction

Conversion to the metric system is increasingly being viewed as a crucial issue facing the United States. In 1988, for the first time in the nation's history, the Congress declared the metric system of measurement as the preferred system. Congressional support for the transition is evident in the amendments to the Metric Conversion Act in 1988. The amendments, which make conversion mandatory for the federal government with certain exceptions, such as impracticality, have led dozens of government agencies to begin planning for metric implementation. However, various problems stand in the way of a successful transition.

The Metric Conversion Act

In August 1988, as part of the Omnibus Trade and Competitiveness Act (P.L. 100-418), the Congress amended the Metric Conversion Act of 1975. The act, as amended, stated that world trade is increasingly geared towards the metric system of measurement and that industry in the United States is often at a competitive disadvantage when dealing in international markets because of its nonstandard measurement system. The act declared it to be national policy

- to designate the metric system of measurement as the preferred system;
- to 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 to United States firms; and
- to seek out ways to increase understanding of the metric system of measurement through educational information and guidance.

The amendments also required federal agencies to establish guidelines as soon as possible after their enactment 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.

Implementation of the Metric Transition

Because metrication is largely viewed as a trade and competitiveness issue, the Department of Commerce serves as the lead agency for metric conversion. The United States Metric Board, which had been established by the Metric Conversion Act of 1975, guided and coordinated metric conversion until 1982. A March 9, 1982, letter from then President Ronald Reagan to the Chairman, United States Metric Board, stated that the Secretary of Commerce "would be responsible for my Administration's

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Only three agencies have advanced very far in transition planning. DOD has issued a plan; GSA has drafted a plan; and the Nuclear Regulatory Commission (NRC) has prepared a detailed draft report examining major areas and options for conversion.

Time frames by which to measure future progress in achieving metric conversion are absent. In fact, no agency provided a time frame indicating the extent of metric conversion by the end of fiscal year 1992, nor has any agency set a specific date for conversion.

Progress Has Been Limited

In addition to specific planning activities, other activities to promote metric conversion have been underway, but progress is limited. Only about a third of the 37 agencies have informed their key officials, who are responsible for implementing metric conversion, of the requirements. In addition, key interagency policy and operating committees and subcommittees, as well as internal agency committees and task forces focusing on specific issues such as procurement, have only begun to explore conversion issues.

Although GAO identified other ongoing agency activities (such as the inclusion of metric language in procurements and grants), these activities are not very far along. Even DOD, which has an important role, acknowledged that it has performed activities essential to the conversion to only a limited extent. Twenty-seven agencies, including key agencies such as Commerce, DOD, and GSA, indicated that 75 percent or more of total work to achieve metric conversion (including guidelines, plans, and other activities) remains to be done.

Various Problems Need to Be Addressed

Problems relating to metric conversion call into question the federal agencies' commitment. Staff resources at Commerce and GSA have been minimal. Despite its lead role, Commerce allocated about 3.5 staff years and GSA about 1.25 staff years for the effort in fiscal year 1989. Resources in other agencies are also very limited. Twenty-seven agencies in fiscal year 1989 allocated less than 1 staff year each; of the remaining 10 agencies, only DOD allocated more than 5 staff years. Increases are shown for fiscal year 1990, but the figures remain at low levels. GAO found that only NRC had estimated the total time and resources needed for the effort. According to a draft report, NRC expects its conversion process to last until 1997 and require 20 to 25 staff years and a total of \$2 million to \$3 million.

Executive Summary

Purpose

Because of growing world markets and concern about international competitiveness, conversion to the metric system is being viewed as an important issue facing the United States. The United States remains the only major industrialized nation with a non-metric measurement system and thus may be disadvantaged in global markets. 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.

In a letter dated July 18, 1989, the Chairman, House Committee on Science, Space, and Technology, requested GAO to review how the federal government is progressing in its implementation of the metric system. GAO surveyed the metric plans, progress, and problems at the 37 largest federal agencies where metric conversion would have the greatest impact.

Background

Because metrication is viewed as a key trade and competitiveness issue, the Department of Commerce serves as the lead agency. Commerce chairs two committees, the Interagency Committee on Metric Policy and the Metrication Operating Committee (MOC), which guide and coordinate the effort. In addition to Commerce, the two other major agencies involved are the General Services Administration (GSA) and the Department of Defense (DOD). However, many agencies face metric-related decisions; for example, the National Aeronautics and Space Administration (NASA) has conducted several reviews of metrication in connection with its proposed space station.

Metric conversion will require a great amount of work. Initial efforts include development of agency guidelines, transition plans, and time frames by which to measure progress. Transition plans are more detailed than guidelines and identify specific areas for review and conversion. Other activities, such as including metric language in federal procurement, grants, and other business activities, are involved in the conversion. Coordination between agencies and with the private sector is also essential.

Results in Brief

Serious difficulties may delay or prevent a timely and comprehensive conversion to the metric system. Federal agencies have not demonstrated a commitment to conversion, although officials at key agencies consider the conversion inevitable. In particular, Commerce as the lead

