Chapter I

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Federal expenditures for civilian-oriented R&D have risen rapidly over the past two decades. In authorizing programs and appropriating funds for civilian-oriented R&D, Congress clearly intends that the benefits from this public investment will be widely distributed throughout society. However, Federal efforts to harness the potential of science and technology to meet social and economic needs have met with only limited success. As recently noted by Presidential Science Advisor Frank Press and Governor George Busbee of Georgia:

> In recent years, Federal funding of R&D for the Civil sector has been growing rapidly [t is now in excess of **$7** billion annually But lts impact on meeting public expectations --on filling the everyday needs of the people – often seems disappo]nting.

A central problem is that for Federal efforts to be successful in fostering technological change, such efforts must be effectively linked to the considerations of those non-Federal parties who produce, deliver, and use goods and services in the civil sector. Incorporating the considerations that guide the actions of these non-Federal decisionmakers into the management decision processes of Federal R&D programs poses a major challenge. in R&D programs where the Federal Government is not the end user of the products of R&D, such factors as

- problem definition,
- choosing among alternative technological solutions,
- bearing of costs and risks,
- criteria for making awards,
- testing and evaluation, and
- introduction to use

should all be dealt with very differently than in areas such as national security and space exploration, where the Federal Government is the end user,

The requirements of the Federal Grant and Cooperative Agreement Act of 1977 provide an opportunity to address in a comprehensive, Government-wide manner this whole range of R&D management issues—both at the conceptual and at the operational levels.[2]

At the conceptual level, the Act requires that in transactions between the Federal Government and non-Federal parties, assistance relationships be distinguished as a class from procurement relationships. Since civilian-oriented R&D is generally not for the Federal Government's own use, transactions for its support fall into the category of assistance relationships. The far-reaching implications of distinguishing assistance from procurement relationships for the conceptualization of the Federal role and responsibilities are developed in chapter II.

At the operational level, the Act establishes uniform, Government-wide criteria for the use of grafits, contracts, and cooperative agreements so that these alternative legal instruments accurately reflect the underlying Federal 'non-Federal relationships. This framework of Federal/non-Federal relationships requires a clear delineation of Federal and non-Federal roles and responsibilities at the level of individual transactions.

The Act also mandates a 2-year, comprehensive study of Federal assistance to be conducted by the Director of the Office of Management and Budget (OMB). This study provides an excellent opportunity to identify, develop, and promote those administrative practices most effective in stimulating technological change in the civil sec-

'Frank Press and George Busbee, "Intergovernmental Science and Technology, " Science 196, May 27. 1977, (editorial).

[2]The text of the Act is presented in appendix^

tor. These operational issues are treated in chapter III.

Chapter IV summarizes the implications of the Act for congressional oversight of Federal efforts to stimulate technological change.

The scope of the Grant and Cooperative Agreement Act is far broader than R&D alone. Approximately one-third of the Federal budget is disbursed through procurement and assistance transactions. The Act is intended as an initial step toward eliminating the waste and ineffectiveness in this major area of Federal spending resulting from confusion over appropriate roles and responsibilities in Federal/non-Federal relationships. The framework established for such relationships is to bring greater order to Federal assistance processes, on the one hand, and preserve the integrity of the procurement system on the other.

In its comprehensive study of Federal procurement practices, the U.S. Commission on Government Procurement conducted a preliminary study of Federal grant-type assistance programs.[3] The Grant and Cooperative Agreement Act embodies the recommendations of that study. The Procurement Commission found that Federal grant-type activities constitute a vast and complex collection of assistance programs that function with little central guidance and in ways often inconsistent even for similar programs. The growth of assistance expenditures to State and local governments, colleges, universities, and other nonprofit institutions has accelerated to the point where outlays for FY 1978 are estimated to total about $80 billion. ' Not only the dollar volume but the diversity of such programs is enormous—the Catalog of Federal Domestic Assistance contains descriptions of approximately 1,000 programs.'

This report considers the relationship between two major streams of activity: (1) Federal efforts to apply the products of R&D to the resolution of social and economic problems, and (2) Federal assistance to State and local governments and other non-Federal recipients for the support or stimulation of a broad range of activities in the public interest. The confluence of these two streams of activity is largely an unfamiliar area—even to those separately familiar with Federal R&D policy or with Federal assistance policy. Nonetheless, the difficulties encountered in more fully realizing the public benefits from Federal support of R&D, together with the recent enactment of the Grant and Cooperative Agreement Act, require that this particular area be thoroughly explored and understood.

Definitions and Scope

For the sake of precision, it is useful at this point to offer two definitions. The term ***technology*** is used here to denote knowledge required for the production and delivery of goods and services. This definition encompasses both physical and social technologies. ***Technological innovation*** refers here to the process by which knowledge is developed and transformed into specific products, processes, and services. The innovation process includes the whole sequence of steps in the development, testing, production, implementation, adoption, diffusion, and use of a technology.

The scope of this report is limited to programs where innovation goals are appropriate. This includes research for specific applications, advanced development, and demonstrations. Basic research, applied research of a broad generic character, and exploratory development, whose purpose is the generation of new scientific and technical knowledge, are not considered.

[3] U.S. Commission on Government Procurement, Report *of* the Commission on Government Procurement, Vol. 3, Part F, Washington, D. C., U.S. Government Printing Office, 1972.

'Executive Office of the President, *Budget of* the United *States* Government: Fiscal Year 1978, Special Analyses I and O, U.S. Government Printing Office, Washington, D. C., 1977.

'Executive Office of the President, 1977 Catalog *of* Federal Domestic *Assistance*, U.S. Government printing Office, Washington, D. C., 1977.